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Reactions to arousal and ambiguity: An application of reversal theory.

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**Reactions to Arousal and Ambiguity:
An Application of Reversal Theory**

by

Joseph Paul Pilon

**A Dissertation
Submitted to the Faculty of Graduate Studies and Research
through the Department of Psychology
in Partial Fulfillment of the Requirements for
the Degree of Doctor of Philosophy at the
University of Windsor**

Windsor, Ontario, Canada

1998

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Abstract

Reversal theory describes people as having bistable cognitive systems that enables switches between either a telic or a paratelic state of mind. A telic state of mind is characterized as being goal-oriented and serious-minded, and a paratelic state of mind is characterized as being activity-oriented and playful. The moderating effects of telic and paratelic states on the level of arousal and on the presence of ambiguity were investigated in the present study. Eighty-four female and 29 male undergraduate students volunteered to participate in a mock diagnosis task which was designed to expose participants to different types of ambiguity. State of mind was expected to interact with both arousal and ambiguity on enjoyment of a task (hedonic tone). Individuals in a telic state were expected to enjoy low arousal and no ambiguity, and individuals in a paratelic state were expected to prefer high arousal and the presence of ambiguity. Also investigated were the relationships between arousal and ambiguity, between lability and paratelic dominance, and between persistence and metamotivational state. The hypothesized interaction effect of metamotivational state and arousal on enjoyment of a task was supported. The implications of this finding concerning homeostatic theories of arousal are discussed. The other hypotheses of this study were not supported. One serendipitous finding, a negative relation between paratelic dominance and performance, was discovered. A post hoc interpretation of this finding is provided.

DEDICATION

This dissertation is dedicated to my spouse and partner, Janet.

Even during the darkest moments of this long journey, she has remained supportive and

has sacrificed much in order to allow me the opportunity to reach this goal.

“I’ll love you forever, I’ll like you for always, as long as I’m living, my love you will be.”

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Introduction

The theory of psychological reversals (Apter, 1982), or reversal theory, represents an innovative approach to understanding motivation which incorporates the importance of phenomenological interpretations of events. Originally developed in 1975 (Smith & Apter, 1975), reversal theory cannot be described as a personality theory, nor does it adopt either a situationist or interactionist perspective. Instead, Apter (1982) uses the term structural phenomenology to describe the ontological perspective of reversal theory. Due to the recency of its development, reversal theory is still undergoing a great deal of elaboration and is in need of much experimental validation and expansion. The primary purpose of this study is to add to the reversal theory literature by expanding the application of reversal theory to the study of ambiguity. Specifically, this study will investigate the impact of metamotivational state on the interpretation of ambiguity.

Reversal Theory

Telic and Paratelic States

According to reversal theory, the motivations for our actions can be divided into two types. At times, our actions are motivated by an ultimate goal which the current action is expected to help attain. At other times, the motivation is intrinsic to the activity itself. Reversal theory asserts that our "state of mind" determines what motivates us, either an extrinsic goal or something intrinsic to the activity (Apter, 1982). When goal-oriented, we are in a telic state of mind. When we are motivated more by the activity itself, we are in a paratelic state of mind. Telic and paratelic refer to metamotivational states or metamotivational modes. Together, they represent a pair of metamotivational

states or modes. According to reversal theory, we regularly switch between these two metamotivational states.

While in a telic state, the major impetus for our behaviour is the attainment of a specific goal. The term 'telic' is derived from the Greek word telos, meaning 'an end' or 'goal' (Apter, 1989). Although behaviour in the paratelic state may also have a goal, one's motivation is to perform the behaviour itself, focusing on the activity rather than on the outcome. Hence, goals are of secondary importance while in the paratelic state. Indeed, the prefix para, meaning 'alongside,' implies that attaining a specific goal is not the overriding purpose of the activity (Apter, 1982).

Reversal theory postulates the existence of at least three other pairs of metamotivational modes in addition to the telic/paratelic pair. These are negativist/conformist, autocentric/allocentric, and mastery/sympathy pairs (Apter, 1982). Each of these pairs of metamotivational modes has an impact on determining what motivates our behaviour. However, each pair of metamotivational modes influence motivation in qualitatively different ways. For example, while the telic/paratelic modes determine if we are goal-oriented or playful, the negativistic/conformist pair of modes determines if we are motivated to behave either contrary to, or in accordance with, salient expectations. The autocentric/allocentric modes determine if you are motivated to place your own needs first or place someone else's needs ahead of your own. The mastery/sympathy modes determine if one is motivated to be either powerful and in control, or to be caring and nurturing.

Reversal theory assumes that these four pairs of modes operate relatively

independently of each other. Hence, our present metamotivational state can be described as a combination of any of the four modes. For example, if one were in a negativistic mode and in a paratelic mode, his or her state would be described as paratelic/negativistic. He or she would be in a playful state of mind and motivated to behave contrary to salient expectations. Hence, if an adolescent in this state had recently been denied permission to go bungy jumping, he or she might do so since it fulfils two aspects of his or her present metamotivational state. That is, to do something that is playful and contravenes his or her parents restrictions of his or her behaviour.

Despite the existence of four pairs of metamotivational states, the vast majority of the reversal theory literature concentrates on the influences of the telic/paratelic pair. As with much of the reversal theory literature, the major focus of this study is restricted to the impact of the telic/paratelic mode. Therefore, subsequent references to metamotivational states refer specifically to the telic/paratelic pair of metamotivational states.

Paratelic Dominance

According to reversal theory, people regularly switch from one metamotivational state to the other throughout the day (Apter, 1989). These switches are referred to as reversals. Walters, Apter, and Svebak (1982) demonstrated this phenomenon by measuring the metamotivational state of 75 office workers for five days in a row. Measurements of state were taken every 15 minutes for eight hours each day. The results indicated that all participants regularly switched between telic and paratelic states throughout the day. In addition, it was obvious that people varied greatly in the

percentage of time they spent in either a telic or paratelic state. While some spent most of the day in a telic state, others remained mostly in a paratelic state, and still others spent approximately the same amount of time in both states throughout the day.

Reversal theorists refer to the relative percentage of time spent in one state as either telic dominance or paratelic dominance. In early reversal theory research, dominance was measured with the Telic Dominance Scale (TDS) developed by Murgatroyd, Rushton, Apter, and Ray (1978). Later, Cook and Gerkoich (1993) generated a new scale to measure dominance specifically for use in North America. This new scale was scored in the opposite direction and entitled the Paratelic Dominance Scale (PDS) in order to differentiate it from the TDS. Hence the terms telic dominance and paratelic dominance appear in reversal theory research and both terms refer to the same construct (i.e., the relative percentage of time one spends in either a telic or paratelic state). This study makes use of the PDS, hence, the term paratelic dominance will be used when referring to the dominance construct. When referring to individuals, it is common in reversal theory literature to refer to them as either telic-dominant or paratelic-dominant, depending on their level of paratelic dominance.

Telic-dominant individuals spend most of their time in a telic state, while paratelic-dominant individuals spend most of theirs in a paratelic state. Although paratelic dominance is assumed to be stable over time, it is not considered a personality trait in the conventional sense. While conventional traits, such as introversion-extroversion (Eysenck & Eysenck, 1963), are defined as predispositions that are stable over time and predict behaviour across situations, paratelic dominance only predicts the

probability of being either in a telic or paratelic state.

Although paratelic dominance is not a personality variable in the conventional sense, it is a very good indicator of a person's general orientation to life. Svebak and Murgatroyd (1985) conducted interviews with ten extreme telic-dominant and ten extreme paratelic-dominant subjects. As predicted by reversal theory, the typical day of a telic-dominant individual was characterized by well planned routines aimed at fulfilling specific goals. By contrast, a day in the life of a paratelic-dominant person was far from routine. Paratelic-dominant people exhibited a spontaneous lifestyle with little attention to goal attainment and a greater readiness to participate in playful activities and to spend time enjoying sensory experiences (Svebak & Murgatroyd, 1985).

A large body of research provides consistent support for the construct validity of paratelic dominance. Expected correlations have emerged between paratelic dominance and other variables, such as gambling addiction (Anderson & Brown, 1984; Anderson & Brown, 1987; Brown, 1988), opiate use (Doherty & Matthews, 1988), obsessive traits (Fontana, 1981), athletic type (Kerr, 1987), choice of sport (Kerr, 1991; Kerr & Svebak, 1989), reaction to stressors (Martin, Kuiper, Olinger & Dobbin, 1987), and physiological reactions to motor and cognitive tasks (Svebak, 1984, 1985, 1986; Svebak & Murgatroyd, 1985; Svebak, Nordby, & Ohman, 1987).

Structural Phenomenological Perspective of Reversal Theory

Apter uses the term "structural phenomenology" to refer to reversal theory's ontological perspective. This is because reversal theory cannot be easily classified as having a trait, situationist, or interactionist perspective. Unlike trait theories, reversal

theory does not assume consistency of behaviour across time or across situation. Instead, reversal theory assumes intra-individual inconsistency across both time and situation. Reversal theory assumes that one's reaction to any situation is influenced by one's metamotivational state which fluctuates between telic and paratelic modes. It should be noted that one's reaction to situations is also influenced by the other three pairs of metamotivational modes: negativist/conformist, autocentric/allocentric, and mastery/sympathy.

Unlike a situationist perspective, reversal theory allows for inter-individual variation in the reaction to identical situations. However, reversal theory cannot be classified as an interactionist theory since it predicts intra-individual variability of reaction to identical situations. That is, we can be expected to react differently to identical situations, depending on our prevailing metamotivational state.

Instead, Apter (1982) describes reversal theory's ontological perspective as structural phenomenology because it combines structuralism and phenomenology to arrive at a highly heuristic description of human experience and behaviour that allows for a great deal of intra-individual variance. Indeed, it seems appropriate to use the terms "structuralism" and "phenomenology" to describe a theory of self-contradiction, since they are almost always mutually exclusive in other contemporary psychological theories. Hence the term "structural phenomenology" is somewhat of an oxymoron.

In reversal theory, both terms, structuralism and phenomenology, are applied very generally (Apter, 1981). Structuralism refers to the use of a structural analogy (i.e., the idea of a bistable system was borrowed from the area of cybernetics) to describe the

mental activity accompanying reversals from one metamotivational state to another. The phenomenological aspect of reversal theory is apparent in its emphasis on the experience rather than the apparent content of situations (Apter, 1981).

Evidence of Bistable Mental Processes

A bistable system alternates between two mutually exclusive states. It is this type of system that Apter (1981) uses to describe people's transitions from one metamotivational state to another. According to reversal theory, four of these bistable systems are in operation, each one governing reversals of the four metamotivational modes; telic/paratelic, negativist/conformist, autocentric/allocentric, and mastery/sympathy. At any one time, our metamotivational state is being influenced by the telic or paratelic mode, but not both at the same time. This is true of the other three metamotivational modes as well.

Support for the existence of a bistable cognitive system is provided by several studies by Svebak and his colleagues who have examined associations between physiological responses (i.e., passive and active electromyography) and telic/paratelic metamotivational states (Apter & Svebak, 1986; Rimehaug & Svebak, 1987; Svebak, 1984, 1985, 1986; Svebak & Murgatroyd, 1985; Svebak, Storfjell, & Dalen, 1982).

Researchers discovered that passive forearm EMG readings were positively correlated with telic state scores (Svebak, 1984; Svebak et al., 1985), while active forearm EMG readings were negatively correlated with telic state scores (Rimehaug & Svebak, 1987). In other words, being in a telic state was associated with an increase in tonic muscle activity and being in a paratelic state was associated with greater phasic

muscle activity. Passive forearm electromyography (EMG) refers to EMG readings of the forearm when it is not involved in a particular activity; active forearm EMG refers to EMG readings of a forearm performing voluntary movement (e.g., use of a video game joy-stick). Passive EMG readings represent tonic (gradual and involuntary) changes in muscle tension while active EMG readings represent phasic (sudden and voluntary) changes.

The fact that telic states resulted in higher passive EMG readings (tonic muscle activity) and paratelic states resulted in higher active EMG readings (phasic muscle activity) led Svebak (1984) to hypothesize a neurological basis for the associations between state and physiological responses. Svebak (1984) hypothesized that different metamotivational states were associated with specific brain systems. If the activity of different brain systems is related to metamotivational state, it would support the assumption of bistability. That is, the brain would operate qualitatively differently depending on one's present metamotivational state.

Phasic and tonic responses are produced by separate frontal lobe regulatory systems; the arousal system is responsible for phasic responses, and the activation system is responsible for tonic responses. Svebak (1984) hypothesized that metamotivational state would be related to the levels of activity within these two brain systems. That is, being in a paratelic state would result in greater activity of the arousal system, and being in a telic state would result in greater activity within the activation system.

The arousal system involves noradrenergic (NE) pathways which are close to the surface of the brain, while the activation system involves dopaminergic (DA) pathways

which are located deeper with the brain (Svebak, 1984, 1985). Because the DA pathways of the activation system are deeper in the cortex than the NE fibers of the arousal system, Svebak (1985) hypothesized that individuals in a paratelic state would produce greater electroencephalograph (EEG) responses than individuals in a telic state. To test this hypothesis, Svebak made EEG recordings of extreme telic- and paratelic-dominant participants while they performed hyperpnoea (rapid breathing) and hypopnoea (breath holding) tasks. As expected, for both tasks, surface brain activity was higher for paratelic-dominant participants. This provided support for the hypothesis that for individuals in a paratelic state, the NE fibers of the arousal system are active.

The Probability of Reversals

Apter (1989) described two classes of factors that increase the likelihood of a reversal. The first class of factors involves frustration in achieving satisfaction. If an activity is no longer enjoyable while in a particular state, one may switch to the opposite state. For example, if the weather turns foul while one is cross-country skiing, the activity becomes unenjoyable and one may shift to a telic state and concentrate on completing the trip and returning to the warmth of a fire. Alternatively, if one is trying to win a regatta (sailing race) but is clearly not going to win, one may switch to a paratelic state and begin enjoying the activity itself instead of simply trying to win.

The second class of factors involves satiation. Satiation refers to a predisposition for reversal when a long time has been spent in one mode. Lafreniere, Cowles, and Apter (1988) demonstrated spontaneous reversals between telic and paratelic states as their participants chose between either a playful video game (assumed to be a paratelic

activity) or a statistics learning program (assumed to be a telic activity). While participants performed these activities, their metamotivational states were measured. As expected, metamotivational state tended to match the appropriate activities. Although some reversals occurred due to frustration, many occurred for no apparent reason other than satiation.

Another factor that predicts the likelihood of a reversal is lability. Lability is considered a stable individual variable and is defined as the frequency with which reversals occur (Apter, 1982). In the previously mentioned study by Walters et al. (1982), the data indicated that people differed in the percentage of time spent in either a telic state or a paratelic state. The study also indicated that the percentage of time spent in one state remained consistent across a five day period. That is, a person's level of paratelic dominance remained stable across all five days. The data also indicated that people differed dramatically in the frequency of reversals they experienced. While some people experienced relatively few reversals (e.g., less than one reversal every five hours), others experienced relatively frequent reversals (e.g., more than four reversals every five hours) (Walters et al., 1982). As with paratelic dominance, people differed in their levels of lability, but the intra-individual variability of lability across five days was very small.

Relation Between Lability and Paratelic Dominance

Apter (1982) makes no claim as to the relationship between lability and paratelic dominance. He only asserts that it is possible that paratelic dominance and lability are independent of each other. That is, people can have an extreme preference for one state and still experience a high number of reversals throughout the day.

However, if a relation does exist between paratelic dominance and lability, lability would be highest for people who are neither extremely telic or paratelic (Apter, 1989). That is, people with paratelic dominance scores who are in the middle of the scale should experience the greatest number of reversals. People with extreme paratelic dominance scores, either in the telic or paratelic direction, should experience the lowest number of reversals. This is because people with moderate paratelic dominance scores have an affinity for neither state, and therefore would be more likely to easily switch from one to the other. Alternatively, people with extreme paratelic dominance scores have an affinity for being either in a telic or a paratelic state, and might be less likely to switch to the less desirable state. The relation between extremity of paratelic dominance and lability will be tested in this study as a secondary hypothesis.

Relation Between Persistence and Metamotivational State

Barr, McDermott, and Evan (1993) hypothesized that individuals would persist longer at a task while in a paratelic state than in a telic state. The authors speculated that individuals in a telic state are more likely to discontinue an activity because frustration, due to lack of goal attainment, is more easily engendered in a telic state than in a paratelic state. Barr et al.'s (1993) research did support this hypothesis. Individuals in a telic state were found to become frustrated more easily and to give up more readily on a task than individuals in a paratelic state. A test of the relation between metamotivational state and persistence will be included as a secondary hypothesis in this study.

Interaction between Metamotivational State and Arousal

Earlier, telic/paratelic states were described as having an impact on motivation. That is, while in a telic state, we are goal oriented, and while in a paratelic state, we are motivated primarily by the activity itself. Besides determining what motivates our behaviour, metamotivational states also influence how we interpret situations. For example, the telic/paratelic pair of states guides how we react to the level of arousal of any given situation. While individuals are in a paratelic state, reversal theory predicts that high arousal is perceived as pleasant. Alternatively, while individuals are in a telic state, arousal is less palatable. Apter (1982) used the term hedonic tone to describe the pleasantness of a situation or activity. Experiencing low hedonic tone is analogous to experiencing a situation or activity as unpleasant. Likewise, experiencing high hedonic tone is analogous to finding a situation or activity pleasant.

Reversal theory's prediction of how people react to the level of arousal of a situation contradicts Hebb and Thompson's (1954) arousal theory. Hebb and Thompson (1954) asserted that the phenomenological experience of a situation depends on the level of arousal. According to Hebb and Thompson, very low levels of arousal result in boredom, moderately low levels of arousal result in relaxation, moderately high levels of arousal result in excitement, and very high levels of arousal result in anxiety.

The relationship between arousal and its subjective interpretation has been described as an inverted-U, also known as the Yerkes-Dodson law (Teigen, 1994). As arousal increases from very low to very high, its subjective interpretation goes from unpleasant (boredom), to pleasant (relaxing or exciting), and returns to unpleasant again

(anxiety). Hence, only moderate levels of arousal should result in pleasant experiences such as relaxation or excitement.

However, Apter (1976) demonstrated that people do have positive emotional reactions (e.g., relaxation or excitement) to extreme levels of arousal. When he asked participants to rate both the affective tone associated with an activity and the level of arousal associated with it, Apter found that many activities could involve extremely high or low arousal levels and still result in non-aversive affective tones.

The discrepancy between arousal theory and Apter's (1976) observations served as a major impetus for the development of reversal theory. Arousal theory states that the phenomenological experience (e.g., bored, relaxed, excited or anxious) depends on the level of arousal. Alternatively, reversal theory predicts that the phenomenological experience of a situation depends upon an interaction between metamotivational state and level of arousal. That is, individuals in a telic state will experience low arousal as relaxation, and high arousal as anxiety. Alternatively, individuals in a paratelic state will experience low arousal as boredom and high arousal as excitement.

This type of interaction (i.e., where a switch from one metamotivational state to its opposite results in an opposite reaction to environmental stimuli) is an important aspect of reversal theory (Apter, 1989). While in a telic state, low arousal is experienced as relaxing, an experience of high hedonic tone. If the individual switches to a paratelic state, the low arousal is now experienced as boredom, an experience of low hedonic tone. Similarly, high arousal in a telic state is experienced as anxiety, and a switch to a paratelic state will cause the high arousal to be experienced as excitement. Switches

between metamotivational states are referred to as reversals because they accompany a reversal of hedonic tone associated with the present situation (Apter, 1989).

This reversal in phenomenological experience of the environment due to a switch from one metamotivational state to another (i.e., a reversal) is central to explaining reversal theory (Apter, 1989). It is the reason why reversal theory is capable of explaining apparent inconsistency within individuals. However, despite being a central premise of the theory, very little empirical work demonstrating these types of interactions exist.

The literature review for the present study revealed only one indirect demonstration of the interaction between metamotivational state and arousal on hedonic tone. Martin et al. (1987) examined the potential stress mediating effects of being paratelic-dominant. The authors hypothesized that paratelic-dominant individuals would be better able to cope with the arousal associated with negative life events. Using mood disturbance as a dependent variable, Martin et al. (1987) discovered an interaction between paratelic dominance and number of negative life events. For telic-dominant individuals, the relation between negative life events and mood disturbance is linear and positive. For paratelic-dominant individuals, the relation between the two variables is curvilinear (i.e., U-shaped). For a low to moderate number of negative life events, the relation between negative life events and mood disturbance is negative. For a moderate to high number of negative life events, the relation between the two variables becomes positive.

The data from Martin et al.'s (1987) study indicate that when experiencing no or

few negative life events, paratelic-dominant individuals experience greater mood disturbances than telic-dominant individuals. However, as the number of negative life events rises above six in the past 12 months, the level of mood disturbance for telic-dominant people is consistently higher than for paratelic-dominant people.

Due to the lack of a direct empirical demonstration of the interaction between metamotivational state and arousal, and because it is a central premise of reversal theory, one of the goals of this study is to determine the effects of this interaction on hedonic tone. Also, the interaction between metamotivational state and arousal is a necessary prerequisite for testing the hypothesized interaction between metamotivational state and ambiguity.

Interaction Between Metamotivational State and Ambiguity

Traditional Perspectives and Definitions of Ambiguity

Ambiguity exists whenever two or more mutually exclusive meanings can be assigned to the same information, due to a lack of information necessary to arrive at a precise conclusion or the presence of contradictory pieces of information (Zimbardo, 1992). Apter (1982) outlined three basic types of ambiguity: incompleteness, borderline, and contradiction. Incompleteness refers to a lack of sufficient information to arrive at only one meaning of a perception. Borderline ambiguities occur when the information is known to have a margin of error that prevents one from making a decision one way or another with much certainty. Contradiction ambiguities involve information that could lead to two mutually exclusive conclusions. This study attempted to induce feelings of ambiguity by exposing participants to either incomplete information or contradictory

information.

Typically, ambiguity is treated as a noxious cognitive element. From a cognitive perspective, we are assumed to be constantly applying structure to the stimuli we perceive. When a structure is not readily available, stimuli are difficult to encode, difficult to recall, meaningless, and confusing. By contrast, when a structure becomes apparent, stimuli become meaningful and more easily encoded and recalled (Sternberg, 1995). An example of this phenomenon is a black and white image of a dalmatian walking through a leaf covered forest. At first, the image contains no meaningful information, but only random black blotches on a white background. However, once a person discovers or is made aware of the image of the dog, the perception of the image is forever changed. The person can no longer view the image without applying a specific structure to it, and the perception of random blotches disappears. Therefore, one might assume that the mind has a preference for structure over ambiguity.

According to Berlyne (1960), uncertainty and ambiguity result in tension, in much the same way that cognitive imbalance and dissonance does. This tension impels cognitive work and individuals seek out missing information in an attempt to alleviate the tension. The drive to seek out missing information (i.e., curiosity) is therefore described as a tension reduction mechanism. Hence, it is implied that the uncertainty and the ambiguity are unpleasant experiences.

The tolerance of ambiguity (TOA) construct is assumed to be a stable personality variable that predicts the degree to which one can endure ambiguous stimuli (Bowen, Qiu, & Li, 1994; Frone, 1990; Furnham, 1994; Furnham & Ribchester, 1995; McLain,

1993; Tsui, 1993). According to the TOA construct, ambiguity is at best tolerated but never enjoyed (Bowen et al., 1994). Yet, ambiguous figures are meant to be fun and entertaining and, as described by Apter (1989), ambiguity plays a central role in much artistic expression, including drama, comedy, painting, architecture, and poetry.

Apter's claim that ambiguity causes anything other than discomfort and anxiety is at odds with other major psychological theories. Theories of tolerance of ambiguity (Bowen et al., 1994; Frone, 1990; Furnham, 1994; Furnham et al., 1995; McLain, 1993; Tsui, 1993) predict that humans dislike inconsistency and contradictions and try to avoid or eliminate them (Apter, 1982). Despite the hegemonic belief that ambiguity is aversive, Apter (1982) claims that "under certain circumstances ambiguous situations would appear to be sought out and to be enjoyed, even if the ambiguity is not resolved" (p.145).

Metamotivational State and Reaction to Ambiguity

According to reversal theory, how we react to ambiguity depends on our metamotivational state. For individuals in the telic state, ambiguity results in negative hedonic tone, and for individuals in a paratelic state, ambiguity results in positive hedonic tone. Apter's (1982) hypothesized interaction between ambiguity and metamotivational state on hedonic tone is based on two assumptions. The first is the interaction between arousal and state on hedonic tone discussed earlier, and the second is that of an assumed positive linear relation between ambiguity and arousal. If both of these assumptions are true, then it follows that ambiguity and state interact in a way similar to the way in which arousal and state are hypothesized to interact.

While in a telic state, people are not expected to enjoy ambiguity because ambiguity is expected to increase arousal. In addition to the increased level of arousal, ambiguity is disliked by individuals in a telic state for an additional reason. People in a telic state are expected to hate ambiguity because it also interferes with goal attainment (Apter, 1982). The attainment of a specific goal is the primary motivation while in a telic state and anything that interferes with this motivation will not be appreciated.

For these reasons, Apter argues that ambiguity plays an integral role in many paratelic activities, especially in appreciating various forms of art, including architecture, literature, painting, cinema, magic, and humour. Ambiguity exists, for example, when we ask whether Moby Dick is antagonist or protagonist, whether the leaning tower of Pisa is stable or falling, whether the Mona Lisa is smiling or not, whether Hamlet is crazy or conniving, and if performers in La Cage aux Folles are male or female.

Research exists which supports the assumption that a positive linear relation exists between ambiguity and arousal. Shackel (1976) demonstrated that the amount of incongruity had a linear positive association with arousal as measured by galvanic skin response (GSR) amplitude. A similar result was discovered in an applied setting by Gellatly and Meyer (1992). The level of ambiguity of one's job was directly related to self-reported levels of arousal and heart rate.

Evidence also exists supporting Apter's ambiguity hypothesis. Martin et al. (1987) discovered that telic-dominant individuals with "resolved recent life stressors" are less depressed than those with "unresolved recent life stressors." The opposite relation was identified for paratelic-dominant individuals, who tended to be less depressed if they

had unresolved life stressors. Perhaps paratelic-dominant individuals appreciate the ambiguity inherent in unresolved issues.

Rationale for the Present Study

Manipulation of Ambiguity

In order to test the primary hypotheses of the present study, it was necessary to manipulate the ambiguity of a situation. In this study, ambiguity was experimentally manipulated by varying a mock disease diagnosis task, a task used earlier by Medin and Edelson (1988) to test the impact of base rate information on decision making. The study included four conditions. Two conditions varied in difficulty level but did not involve ambiguity (see below). The other conditions exposed participants to two different types of ambiguity. Following Apter (1982), the ambiguity was due to either incomplete information (Incomplete Ambiguity condition), or contradictory information (Contradictory Ambiguity condition). A more detailed description of the mock diagnosis task is located in the method section of the pilot study.

Manipulation of Difficulty

Different types of ambiguity can be introduced into the disease diagnosis task by varying its design. However, a serious confound exists in that, whenever the ambiguity of a task increases, its level of difficulty also rises. Because difficulty and ambiguity are inextricably linked, it would be difficult to ascertain if any changes in the dependent variable are due to the change in ambiguity alone.

In an attempt to deal with this confounding variable, two non-ambiguous conditions were used in the experiment. In the first condition, the disease diagnosis task

was Easy and Not Ambiguous (ENA). In the second condition, the task was Difficult and Not Ambiguous (DNA).

To determine if the level of difficulty of the disease diagnosis task under the DNA condition was comparable to the difficulty levels of the diagnosis tasks in the two ambiguity manipulation conditions, a pilot study was conducted. Both the method and results of the pilot study are reviewed in the sections following the introduction.

Metamotivational State

Several of the hypotheses tested in the present study involve relations and interactions with metamotivational state. The incorporation of this variable in research has evolved over the course of reversal theory research. It is important to briefly review the different ways in which metamotivational state is dealt with in order to justify the method used in the present study.

Early reversal theory researchers (Svebak et al., 1982) attempted to induce a telic state by threatening participants with electrical shock if their performance on a perceptual-motor task dropped below a certain level. The benefit of attempting to manipulate metamotivational state as a true independent variable is the increased internal validity of a true experimental design. However, metamotivational state cannot be manipulated directly. Researchers can only try to induce it. Unfortunately, attempts to induce a telic state have the potential of creating confounding variables. That is, while the threat of electrical shock does induce a telic state, it also has the potential to cause other differences among participants such as, for example, differentially influencing motivational level.

Other researchers (Martin et al., 1987) assigned participants to either telic or paratelic groups based on paratelic dominance scores; extreme paratelic-dominant individuals were assumed to be in a paratelic state during the experiment while extreme telic-dominant participants were assumed to remain in a telic state (Martin et al., 1987). However, one's paratelic dominance is far from a perfect predictor of one's state at any particular time (Rimehaug & Svebak, 1987; Svebak, 1986).

Instead of attempting to manipulate metamotivational state or using paratelic dominance scores to indicate metamotivational state, Rimehaug and Svebak (1987) treated state as a continuous individual variable. The sample used by Rimehaug and Svebak (1987) consisted of an equal distribution of people with high, moderate, and low paratelic dominance scores; state was then measured during the experiment. In their analysis, metamotivational state was treated as a continuous predictor variable. In the present study, metamotivational state was dealt with in a similar fashion.

Primary Hypotheses

One of the major premises of reversal theory is that metamotivational state and arousal interact on hedonic tone. Therefore, the following hypothesis is proposed:

Hypothesis 1: For individuals in a telic state, the relation between arousal and hedonic tone will be negative. For individuals in a paratelic state, the relation between arousal and hedonic tone will be positive.

Ambiguity is expected to be positively related to arousal, leading to:

Hypothesis 2: Participants in conditions involving ambiguity will have significantly higher levels of arousal than participants in conditions with no ambiguity.

If the first two hypotheses hold true, then it follows that metamotivational state also interacts with ambiguity. Therefore:

Hypothesis 3: For individuals in a telic state, ambiguity will result in low hedonic tone.

For individuals in a paratelic state, ambiguity will result in high hedonic tone.

Secondary Hypotheses

The present study was designed specifically to test the first three hypotheses.

Two additional hypotheses were included primarily because the method allowed for them to be tested.

The fourth hypothesis tests the relationship between extremity of paratelic dominance and lability. As discussed previously, lability represents the frequency and ease with which individuals experience reversals. In the present study, lability was operationally defined in two ways: the number of reversals that the participant exhibits, and the within-subject variability of state scores. In both cases, a higher value represents greater lability. Extremity of paratelic dominance is defined as the absolute deviation of each participant's paratelic dominance score from the median paratelic dominance score. The relationship between extremity of paratelic dominance and lability is expected to be negative, so that:

Hypothesis 4: Extreme telic and paratelic-dominant individuals will be significantly less labile than individuals that are only moderately telic or paratelic-dominant.

While in a telic state, individuals are goal oriented. That is, their behaviour is motivated by attempting to attain a specific goal. If the goal were to become unnecessary, the individual would no longer persist at the task. Therefore:

Hypothesis 5: Individuals in a telic state will demonstrate significantly less persistence at a "goal-less" task than individuals in a paratelic state.

Pilot Study

Method

Participants

Participants were recruited from introductory psychology classes. Thirty-six students volunteered to participate in the pilot study in exchange for one experimental credit point. Twenty of the participants (56%) were male and 16 (44%) were female. All participants were treated in compliance with the American Psychological Association's guidelines for ethical treatment of participants in experimental research.

Dependent Measure

Using a repeated measures design, each participant was exposed to four experimental conditions. Participants were asked to rank each of the four conditions in terms of their relative difficulty. Hence, the dependent measure used in the pilot study was an ordinal variable consisting of the rank order of the perceived difficulty of the experimental conditions.

Procedure

Prior to asking students to participate in this study, the experimenter gave a brief presentation of approximately two to three minutes to the students for the purpose of soliciting their participation (Appendix A). Participants for both the pilot study and the experiment were recruited simultaneously.

After the presentation, a schedule sheet was circulated and students were asked to print their name and phone number in the area corresponding to the date and time when they wished to participate (Appendix B). In addition to the schedule sheet, each student

who intended to participate was given an information sheet (Appendix C) that included directions to the participation room and a place for them to mark their appointment time and date.

When the participant met with the experimenter, the experimenter explained the purpose of the study and what the procedure involved (Appendix D). After being briefed, and signing the consent form (Appendix E), participants were escorted to an adjacent room and seated in front of the computer (386SX IBM compatible). Participants were asked to read the instructions on the screen carefully and told that the computer would guide them through the remainder of the experiment.

The computer program first guided participants on how to respond to the mock disease diagnosis task (Medin & Edelson, 1988). During the training phase, the participants were exposed to 16 blocks of training trials where each block consisted of 12 learning trials, separate attempts to diagnose six hypothetical diseases based on two symptoms. Three of the diseases were presented once while the other three were presented three times each during each 12-trial block.

As participants attempted to diagnose diseases, they used the feedback to learn how to make correct diagnoses (i.e., participants learned which symptoms were associated with which disease). The training phase was terminated if the participant was correct on every trial for two consecutive blocks. When Medin and Edelson (1988) used this task, all 32 participants met this learning criterion within 14 blocks of trials.

Some of the symptoms were unique to one disease while other symptoms were shared by two of the diseases. The computer program displayed two of the symptoms

and the various disease names to choose from. (Refer to Figure 1 for an example.) The order of the symptoms and the disease names were randomly selected for each trial. After the participant chose one of the diseases, the computer gave the participant feedback. If the participant chose the correct disease, the program informed the participant that his or her choice was correct (Figure 2). If the participant did not choose the correct disease then the program informed the participant which disease he or she should have chosen (Figure 3).

An abstract representation of a typical set of learning trials is shown in Table 1. Symptoms labelled *a*, *d*, and *g* were shared by two diseases, while the symptoms labelled *b*, *c*, *e*, *f*, *h*, and *i* were unique to one disease. Diseases 1, 3, and 5 appeared three times each during one block of learning trials and diseases 2, 4, and 6 appeared only once.

After they had completed the training trials successfully, all the participants were exposed to each of the four experimental conditions, presented in random order. Each experimental condition consisted of 18 diagnosis trials. Two of the conditions varied in difficulty and did not involve any ambiguity. In the Easy Not Ambiguous (ENA) condition the number and combination of symptoms and diseases were exactly as they appeared in the training trials. In the Difficult Not Ambiguous (DNA) condition, only one symptom was used. The symptom used in each transfer trial of the DNA condition was the symptom that was unique to each disease. Thus, although there was no ambiguity as to which disease was the correct one, having only one cue should have made the task more difficult.

The other two experimental conditions presented participants with two kinds of

Training Block # 1 Trial # 1

Symptom #1: shortness of breath

Symptom #2: blurred vision

- 1. namitis**
- 2. terrigitis**
- 3. ballois**
- 4. althrax**
- 5. coralgia**
- 6. stareopsis**

Select an option {1-6}.

Figure 1. Computer screen display for disease diagnosis task.

Training Block # 1 Trial # 2

**symptom #1: heartburn
symptom #2: skin rash**

- 1. ballesia**
- 2. coralgia**
- 3. terrigitis**
- 4. althrex**
- 5. namitis**
- 6. stereopsis**

Select an option (1-6).

ballesia is correct.

Press [RET] to continue.

Figure 2. Computer display of feedback for a correct response.

Training Block # 1 Trial # 1

**symptom #1: shortness of breath
symptom #2: blurred vision**

- 1. nanitis**
- 2. tarrigitis**
- 3. hallosis**
- 4. althrax**
- 5. ceralgia**
- 6. stereopsis**

Select an option (1-6).

**nanitis is not correct.
The correct answer is ceralgia.**

Press (RET) to continue.

Figure 3. Computer display of feedback for an incorrect response.

Table 1

Abstract Representation of a Learning Trial

Disease	Relative Frequency	Symptoms
1	3	a,b
2	1	a,c
3	3	d,e
4	1	d,f
5	3	g,h
6	1	g,i

ambiguity. In the Incomplete Ambiguity condition (IA), only one symptom was used. This time, it was the symptom that was shared by two of the diseases, which introduced ambiguity into the task because the symptom was an indicator of more than one disease. As defined by Medin and Edelson (1988), and as explained to the participants during the training trials, in this condition the disease with the highest base rate was the "correct" answer. Thus, the disease that had been presented three times more often than the other during the training trials was considered to be the correct answer.

In the Contradictory Ambiguity condition (CA), the participant had to make a diagnosis from pairs of symptoms that differed from the pairs presented in the training trials. Pairs of symptoms were constructed to include one symptom from a disease that had been presented three times per block of training trials, and one from a disease that had been presented only once. These symptoms offered contradictory information regarding the correct diagnosis. As in the IA condition, participants were expected to rely on base rate information from the training trials to make the most appropriate (i.e., most probable) diagnosis.

After completing the first experimental condition, participants were prompted to complete two blocks of training trials to refresh their memory of which symptoms were associated with which diseases. After completing the second experimental condition, participants were prompted by the computer to rank the difficulty of the condition with respect to the previous condition. After having ranked the conditions, the participant was again asked to complete two blocks of training trials prior to moving on to the third experimental condition. The same procedure was followed after presentation of the third

experimental condition. After the fourth experimental condition, participants were asked to rank the difficulty level of the fourth condition with respect to the three previous conditions. Once all four conditions were completed and ranked, the computer instructed participants that the study was over and that they could leave the room.

As participants exited the room, they were met by the experimenter for debriefing (Appendix F). The goal of the debriefing was to determine if participants had any trouble performing the tasks or ranking the conditions in terms of their difficulty and to explain the purpose of the pilot study and the experiment. The experimenter reviewed the purpose of the pilot study and how the disease diagnosis task would be used to test the hypotheses of the experiment. If participants had no further questions, they were thanked for participating and excused from any further involvement.

Results

The dependent measure consisted of participants ranking of the four experimental conditions in terms of perceived difficulty. The easiest condition was given a rank of one, and the most difficult was given a rank of four. The purpose of the pilot study was to determine whether or not significant differences existed between pairs of experimental conditions. Differences between the DNA and IA conditions, and the DNA and the CA conditions were of primary interest. This is because the DNA condition is acting as a control condition for the amount of perceived difficulty. It was hoped that differences in perceived difficulty between these groups would be nonsignificant.

An omnibus non-parametric test of repeated measure was not found; hence, the analysis proceeded immediately to all possible pair-wise comparisons using the Wilcoxon Match-Pairs Signed-Ranks Test (Siegel & Castellan, 1988). Pair-wise comparisons were also conducted using a lesser known, but more powerful, form of analysis called a Permutation Test (Siegel & Castellan, 1988). None of the comparisons yielded significant results. Hence, it was assumed that participants perceived the conditions to be equally difficult.

Experiment

Method

Participants

Experimental participants were recruited from introductory psychology classes and received one experimental credit point in exchange for their participation. All participants were treated in compliance with the American Psychological Association's guidelines for ethical treatment of participants of experimental research. Of the 115 participants recruited for the experiment, data from 113 were used.¹ Eighty-four participants (74%) were female, and 29 (26%) were male.

Measures of Dependent and Predictor Variables

Measures of dependent (hedonic tone) and predictor (paratelic dominance, metamotivational state, psychological arousal) variables were taken with the aid of a computer and a program that prompted the participants to respond to specific questionnaire items. The independent variable (difficulty and ambiguity variations of the diagnosis task) was manipulated on the same computer in the same room used during the pilot study.

Paratelic dominance was measured using the Paratelic Dominance Scale (PDS) (Appendix G). The three subscales of the PDS are Playfulness, Spontaneity, and Arousal

¹Data from two participants were not included in the data base. Inspection of the reaction times indicated that one of the participants was responding arbitrarily to items. The reaction times of this participant were consistently less than one half second. For a typical training trial, the mean reaction time is 7.92 seconds, with a standard deviation of 2.52. The second participant did not complete the task and explained that he did not feel well enough to continue.

Seeking. These subscales do not represent orthogonal dimensions of telic/paratelic dominance. Instead, they represent three aspects of being paratelic-dominant: means-end, temporal, and intensity (Apter, 1989). The means-end or playfulness aspect of paratelic dominance represents the frequency with which individuals see themselves engaged in activities whose overriding purpose is to enjoy the activity rather than to achieve a specific goal extrinsic to the activity. The temporal or spontaneity aspect of paratelic dominance represents the frequency with which a person engages in activities spontaneously as opposed to engaging in activities that require planning ahead. The intensity or arousal seeking aspect of paratelic dominance represents the frequency with which a person engages in activities that increase arousal rather than reduce it.

According to reversal theory, being paratelic-dominant implies a person would score high on all three of these subscales. Alternatively, being telic-dominant implies a person would score low on each of the subscales. Hence, one would expect these three aspects of dominance to be highly inter-correlated. Studies assessing the reliability and validity of telic/paratelic dominance scales have found the inter-subscale correlations to be positive and significant (Cook & Gerkovich, 1993; Murgatroyd et al., 1978). Because the subscales are inter-correlated, analyses using paratelic dominance are performed using the PDS in its entirety and not done using individual subscales. This is because the combination of all three subscales will offer a more reliable measure than any of the subscales used individually. The internal reliabilities (as measured by Cronbach's alpha) of the Playfulness, Spontaneity, and Arousal Seeking subscales have been reported to be .78, .83, and .84 respectively (Cook & Gerkovich, 1993).

Metamotivational state was measured with the Telic/Paratelic State Inventory (T/PSI) (Appendix H), a state measure with two subscales: Serious-Minded/Playful (SM/P) and Arousal-Avoidant/Arousal-Seeking (AA/AS) (Cook, Gerkovich, Potocky, & O'Connell, 1993). The SM/P subscale assesses the degree to which a person is presently in either a serious-minded (i.e., goal-oriented) or playful (i.e., spontaneous) state of mind. The AA/AS subscale assesses the degree to which a person is presently either attempting to avoid arousal or seeking to increase his or her level of arousal. As with the subscales of the PDS, the subscales of the T/PSI do not represent orthogonal dimensions, but are positively correlated (Cook et al., 1993). Hence, analyses involving metamotivational state are performed using the T/PSI scale in its entirety and not done using individual subscales. The corresponding alphas for the SM/P and the AA/AS subscales are .93 and .83 respectively (J. Calhoun, personal communication, July 31, 1996).

Hedonic tone was measured using five 6-point bipolar items (Appendix I). The items were generated by the author using Apter's (1982) description of hedonic tone as guidelines. According to Apter (1989), high hedonic tone is associated with the absence of anxiety or boredom, and the experience of either excitement or relaxation. Bi-polar items were generated using these terms as adjectives (e.g., I felt bored while doing the task / I felt excited while doing the task). Participants were asked to indicate using the scale how they felt while performing the disease diagnosis task. Also included were bipolar items asking participants to indicate how they felt about doing the experimental task (e.g., I did not enjoy doing the task / I did enjoy doing the task). The reliability of these items was examined using the data collected during the study and is reported in the

results section below.

Arousal was measured using two methods: heart rate, and an author-generated self-report measure of psychological arousal (self-reported arousal) (Appendix J). Heart rate was measured using a Cardio Sport Heart Monitor, an ECG accurate heart monitor usually used to measure heart rate while exercising. The electrode portion of the heart monitor consists of a one piece elasticized band that is placed around the waist at approximately the height of the third rib. The emitter and receiver portions of the heart monitor were located in the room adjacent to the participant. The receiver produced an audible sound for each heart beat cycle. These audible sounds were recorded for analysis.

Later, each cassette recording was played back and recorded as a digital sound file and stored on computer disk. In addition to the audible beeps that represented heart beat cycles, the recordings included signals produced by the computer to indicate various events during the study including the beginning and end of training trials, and the beginning and end of the experimental trial.

Heart rate for a particular time interval was assessed by counting the number of heart beats that occurred during a specific interval of time. The number of heart beats was then divided by the exact amount of time elapsed from the beginning of the first heart beat cycle until the beginning of the last cycle within the period in question. Having the recording in the form of a digital sound file made it possible to measure this period of time with an accuracy of within one millisecond.

For each participant, heart rates were assessed at five different periods. The first measurement taken was a baseline measure of heart rate. This was assessed using the

heart rate during the last ten seconds of a three minute resting period prior to beginning the experiment. The remaining four measurements of heart rate were taken from four different periods during the experimental trial; at the beginning of the experimental trial, and 25, 50, and 75 seconds from the beginning of the experimental trial. The period of time used to calculate the participant's heart rate at each interval was approximately ten seconds. These measurements of heart rate were used to generate two dependent measures: absolute heart rate, and adjusted heart rate. Absolute heart rate was the number of beats per second. The adjusted heart rate was calculated by subtracting the absolute heart rate from the baseline.

Self-reported arousal was measured using one 6-point Likert type item (Appendix J). Instructions that accompanied the question elaborated on the meaning of psychological arousal so as to eliminate the possibility of participants interpreting the term 'arousal' as meaning sexual arousal.

Procedure

Upon arrival, participants were briefed by the experimenter (Appendix K) as to the purpose of the study and what the procedure involved. During the briefing, participants were told that the purpose of the study was to assess physiological responses (e.g., heart rate) to a variety of problem-solving tasks.

After reading and signing the consent form (Appendix L), participants were escorted to the adjacent room and shown the computer and heart monitor. In the case of female participants, this task was performed by a female research assistant. Participants were shown how to put on the monitor and how to work the intercom system. If the

participant had no further questions, the researcher left the room and waited for the participant to contact the researcher through the intercom system as instructed in the briefing session. At the same time, the experimenter checked to see if the heart monitor was working properly. After being left alone, the participant was led by the computer through several stages of the procedure. Table 2 summarizes these stages.

Before starting the experiment, the participant was asked to relax for three minutes in order to get a baseline measure of heart rate. After a baseline recording was made, the participant was instructed to press any key on the computer to start the computer program.

The program began by prompting the participant to complete the Paratelic Dominance Scale (PDS) (Appendix G). Instructions for completing the PDS were presented on the screen and when the participant was ready, he or she pressed a key to begin responding to individual items. The 30 items of the PDS were presented one at a time and the participant was instructed to respond by either pressing a "T" for true, or an "F" for false.

After completing the PDS, the participant was prompted by the computer to complete the Telic/Paratelic State Inventory (T/PSI) (Appendix H). The instructions for completing the T/PSI were presented on the screen, and when the participant was ready, he or she pressed a key to begin responding to the T/PSI. The T/PSI items were presented one at a time and participants responded by selecting a number from one to six.

After completing the T/PSI, the participant was informed by the computer that the training phase of the mock disease diagnosis task would begin. The training trials of the

Table 2

Computer Guided Portion of Experimental Procedure

Step	Description
<hr/>	
1	Assessment of baseline heart rate.
2	Administration of PDS.
3	First administration of T/PSI.
4	Completion of diagnosis task training.
5	Second administration of T/PSI.
6	Completion of diagnosis task (experimental trial).
7	Administration of hedonic tone scale.
8	Administration of psychological arousal scale.
9	Third administration of T/PSI.
10	Feedback on performance on diagnosis task.
11	Optional second performance of diagnosis task.

Note. PDS = Paratelic Dominance Scale. T/PSI = Telic/Paratelic State Inventory.

study were identical to those used in the pilot study. Once the training trials were completed, the participant was prompted once again to complete the T/PSI. After completing the T/PSI a second time, the participant was informed by the computer that the experimental trials would begin. The computer randomly chose one of the four treatment conditions (ENA, DNA, IA, or CA) to administer to the participant. Characteristics of each of the experimental conditions have been previously discussed in the method section of the pilot study.

Once the experimental trials were completed, the remaining measures were administered. These included the hedonic tone scale (Appendix I), a measure of self-reported arousal (Appendix J), and the third administration of the T/PSI. The computer then told participants how well they had done on the experimental trials (percentage of correct disease diagnoses). The computer informed participants that the procedure was over and that they were free to go; however, if they wished, they could attempt the experimental trials one more time. They were instructed to press any key to do the experimental trials again; otherwise, they were to remove their heart monitor and leave the room.

As the participants left the room, they were greeted by the experimenter and debriefed (Appendix M) before being dismissed. The goal of the debriefing was to determine if participants had any trouble understanding or complying with any of the instructions. Also, participants were informed of the general purpose of the experiment. If they had no further questions, they were thanked and excused.

Results

Descriptive Statistics

Paratelic Dominance Scale

The Paratelic Dominance Scale (PDS) includes three subscales, Spontaneity, Playfulness, and Arousal Seeking, with scores on each ranging from 0 to 10. Therefore, the PDS, which is represented by the sum of the subscale scores, ranges from 0 (extreme telic-dominant) to 30 (extreme paratelic-dominant). The distribution of the PDS scores was not skewed, and its kurtosis score indicated a flat, even distribution. Means, standard deviations, and Cronbach's coefficient alphas for the PDS and its subscales are located in Table 3. Reliabilities for the PDS and its subscales were all equal to or above .73, indicating that the scale was sufficiently reliable to be used in subsequent analyses.

Telic/Paratelic State Inventory

The Telic/Paratelic State Inventory (T/PSI) was administered three times during the study: prior to beginning the training trials (T/PSI1), again prior to beginning the experimental trials (T/PSI2), and a third time after completing the experimental trials (T/PSI3). The T/PSI is comprised of two subscales, Serious-minded/Playful (SM/P) which includes seven items, and Arousal-Avoidant/Arousal-Seeking (AA/AS) which includes five items. Low scores indicate being in a telic state. The means, standard deviations, and Cronbach's coefficient alphas for all three measures of the T/PSI and the subscales are found in Table 3.

The reliability coefficients from the three administrations of the T/PSI scales were very high, ranging from .85 to .87. The reliabilities of the SM/P subscale were also very

Table 3

Variable and Subscale Means, Standard Deviations, Reliability Coefficients, and Ranges

Variable	Mean	SD	Alpha	Range
Paratelic Dominance	11.85	6.10	.87	0-30
Spontaneity	2.12	2.27	.79	0-10
Playfulness	4.99	2.61	.83	0-10
Arousal Seeking	4.74	2.97	.73	0-10
Telic/Paratelic State 1	40.74	10.41	.85	12-72
SM/P	22.94	7.12	.87	7-42
AA/AS	17.80	4.52	.59	5-30
Telic/Paratelic State 2	40.74	11.45	.87	12-72
SM/P	22.73	7.12	.87	7-42
AA/AS	18.01	5.08	.70	5-30
Telic/Paratelic State 3	41.31	10.73	.86	12-72
SM/P	23.40	7.61	.89	7-42
AA/AS	17.91	4.13	.51	5-30
Hedonic Tone	15.24	4.48	.86	4-24
Self-Reported Arousal	3.52	1.38	--	1-5
Performance	11.71	5.83	--	0-18
Lability				
Number of Reversals	0.30	0.55	--	0-2
Variability of T/PSI	17.37	27.24	--	--

Note. SM/P = Serious-Minded/Playful. AA/AS = Arousal-Avoidant/Arousal-Seeking.
T/PSI = Telic/Paratelic State Inventory.

high, ranging from .87 to .89. The reliabilities of one of the subscales, AA/AS, were lower, ranging from .51 to .70. Considering the strength of the reliability of the entire scale, all items were retained in the T/PSI scale.

Hedonic Tone

Hedonic tone (Appendix I) was measured using four of the original five items. One of the items, "I felt relaxed while doing the task/I felt anxious while doing the task," had an item-remainder of scale correlation too low, $r(113) = .12$, $p = .21$, to be retained.² The remaining four items and their respective item-remainder of scale correlations were; (1) "I did not enjoy doing the task/I did enjoy doing the task," $r(113) = .77$, $p < .01$; (2) "I felt bored while doing the task/I felt excited while doing the task," $r(113) = .57$, $p < .01$; (3) "The task was pleasant to do/The task was not pleasant to do," $r(113) = .74$, $p < .01$; and (4) "I liked doing the task/I hated doing the task," $r(113) = .77$, $p < .01$. These four items were scored from one to six; hence, the range of the hedonic tone scale is from four (low hedonic tone) to 24 (high hedonic tone). The mean, standard deviation, and Cronbach's coefficient alpha for the hedonic tone are located in Table 3. The reliability of the hedonic tone scale using the four items listed above was .86.

Performance

Performance was measured by the number of correct diagnoses achieved during the experimental trials. A maximum of 18 correct diagnoses was possible. As reported

²There is no apparent reason for why this item did not load well with the remaining items. Its distribution was not skewed, and its mean and standard deviation were comparable to those of the other items.

in Table 3, the mean and standard deviation of the performance score were 11.71 and 5.83 respectively.

Lability

Lability was operationally defined in two ways. First, it was defined as the number of reversals exhibited by participants. Metamotivational state was measured three times over the course of the experiment. Therefore, the number of possible reversals could range from zero to two. A reversal was defined as any time consecutive measures of metamotivational state indicated a switch from one state to its opposite state. That is, the state score goes from low to high or high to low. The median score of all three state measures was used as the mid-point when determining if participants' states had switched. Of the 113 participants, 84 made no reversals, 24 made one reversal, and five made two reversals. The mean and standard deviation of the number of reversals for all participants are reported in Table 3.

The second way lability was operationally defined was the level of intra-individual variability of the metamotivational state score. For each participant, a mean metamotivational state score was calculated from the three measures of state taken during the experiment (i.e., T/PSI1, T/PSI2, and T/PSI3). Then, three deviation scores were calculated for each participant by subtracting each T/PSI score from the mean. These deviation scores were squared and summed to produce a sum-of-squares score that represents intra-individual variability. Small variability scores represent low lability, and high variability scores represent high lability. Descriptive statistics of this lability measure are reported in Table 3.

Persistence

Persistence was defined simply as whether or not a participant volunteered to perform the experimental task an additional time after the supposed conclusion of the experiment. Participants were divided into two groups. Those who did not choose to perform the task again were placed in the non-persisting group. Those who chose to perform the task again were placed in the persisting group. Of the 113 participants, 87 did not perform the transfer task again, while 26 did.

Measurements of Arousal: Heart Rate and Self-Reported Arousal

Two measures of heart rate were recorded, absolute heart rate and adjusted heart rate. Absolute heart rate represents the participant's heart rate at the time of testing. Adjusted heart rate represents the participant's heart rate at the time of testing, minus the baseline rate record prior to starting the experimental procedure. Heart rates³ for four periods during the experimental trials are reported in Table 4. Both the absolute and adjusted heart rates displayed a similar pattern. Participants demonstrated an elevated heart rate at the beginning of the experimental trail, and then the heart rate quickly returned to a baseline level for the remainder of the experiment.

A repeated one-way ANOVA of the absolute heart rates yielded a significant result, $F(3,297) = 15.59, p < .01$. Post hoc analyses using paired t-tests and Bonferroni

³For twelve of the participants, the heart monitor did not function properly; therefore, accurate measures of the heart rate were obtained for 101 participants. One participant completed the experimental trial in less than 50 seconds. For this person, heart rate measures were obtained from the beginning of the experimental trial and at the 25th second interval only.

Table 4

Means and Standard Deviations of Absolute and Adjusted Heart Rates During Experimental Trials

		Time From Beginning of Trial (seconds)			
Heart Rate					
(beats per minute)		0	25	50	75
Absolute					
<u>M</u>		83.91	80.52	80.76	81.13
<u>SD</u>		12.64	13.01	12.51	11.40
Adjusted					
<u>M</u>		2.95	-0.48	-0.40	-0.03
<u>SD</u>		7.96	7.49	6.86	6.95

corrections demonstrated the heart rate at the beginning of the experimental trial to be significantly higher than at 25 seconds, $t(100) = 4.70$, $p < .01$, 50 seconds, $t(99) = 4.70$, $p < .01$, and at 75 seconds, $t(99) = 4.63$, $p < .01$, into the experimental trial. All other comparisons were nonsignificant.

Self-reported arousal was measured using one 6-point scale asking participants to indicate their present sense of felt psychological arousal. The mean and standard deviation of this scale is located in Table 3. Correlations between the self-reported arousal measure and heart rate indicate that self-reported arousal was positively correlated to absolute heart rate at the beginning of the experimental trial only, $r(101) = .24$, $p < .05$.

It was hoped that an accurate and continuous measure of heart rate would have yielded a more sensitive measure of psychological arousal than a single item response scale. As it turned out, the single item response scale used to assess psychological arousal generated more informative data than the measure of heart rate. Any impact the experimental trial did have on heart rate was short lived since heart rates returned to their baseline levels within 25 seconds of beginning the experimental trial. Because of the lack of impact the experimental trial had on heart rate across the entire length of the experimental trial, self-reported arousal rather than heart rate was used as the measure of psychological arousal for all subsequent analyses.

One-Way ANOVAs for Independent Samples

One-way ANOVAs were performed on many of the variables measured including PDS, T/PSI1, T/PSI2, T/PSI3, hedonic tone, performance, lability, persistence, and self-reported arousal. Two measures of lability exist, number of reversals, and intra-

individual variability of T/PSI score. The independent variable consisted of the experimental conditions whose four levels were Easy Not Ambiguous (ENA), Difficult Not Ambiguous (DNA), Incomplete Ambiguity (IA), and Contradictory Ambiguity (CA). Except for the analysis involving self-reported arousal, these analyses do not represent tests of specific hypotheses. Instead, these represent exploratory analyses to aid in the discussion of results.

Two of the above mentioned variables were treated as categorical variables: persistence, because it is a dichotomous variable with only two levels, and number of reversals, because the distribution was highly skewed since most of the participants made no reversals during the experimental procedure. To assess the association between persistence and experimental condition, a Pearson's Chi-Squared Test of Association test was performed. To assess the association between number of reversals and experimental condition, a Kruskal-Wallis one-way ANOVA was performed. Both analyses yielded nonsignificant results. As a result, there is no evidence to suggest that the experimental conditions had any influence on participants' decision to perform the task one additional time (persistence) or any impact on inducing reversals.

Some of the variables mentioned above were measured prior to commencement of the experimental trial. These include PDS, T/PSI1 and T/PSI2; hence, it was expected that the ANOVAs of these variables would be nonsignificant. The F-ratios of these three analyses were in fact nonsignificant. This helps affirm that the four experimental groups were relatively equal with regard to these variables prior to beginning the experimental trial.

The ANOVAs of intra-individual variability of T/PSI score (a measure of lability) and T/PSI3 were nonsignificant. Hence, it is reasonable to assume that the experimental condition did not influence either lability or metamotivational state. In subsequent analyses, metamotivational state (as measured by T/PSI3) was used as a predictor variable. Hence its lack of association with experimental condition increases the level of internal validity of such analyses. That is, its (T/PSI3) independence from other variables increases the validity of the conclusion that it had a specific and unique impact on other variables.

The ANOVAs of the three remaining variables, hedonic tone, $F(3,109) = 4.02, p < .01$, performance, $F(3,109) = 62.62, p < .01$, and self-reported arousal, $F(3,109) = 5.08, p < .01$, resulted in significant F-ratios. The group means and results of post hoc analyses are reported in Table 5. The Easy Not Ambiguous condition had a significantly higher level of hedonic tone than the Contradictory Ambiguity condition indicating that participants enjoyed the former condition significantly more than the latter, more difficult condition.

The performance scores for the experimental conditions mirrored the hedonic tone scores. The condition with the highest performance score was the ENA condition, followed by the DNA, then the IA, and the CA condition had the lowest performance score. Both the ENA and the DNA condition were significantly higher than the IA and the CA conditions, and the IA was significantly higher than the CA condition. The one-way ANOVA of self-reported arousal constitutes a direct test of hypothesis two; hence, a description of its results is left for the next section.

Table 5

Post Hoc Tests of One-Way ANOVAs

Condition	Dependent Variable		
	Hedonic tone	Arousal	Performance
Easy Not Ambiguous	17.00 _a	4.07 _a	16.96 _a
Difficult Not Ambiguous	16.00	2.78 _b	14.93 _a
Incomplete Ambiguity	14.75	3.78 _a	10.06 _b
Contradictory Ambiguity	13.15 _b	3.38	4.73 _c

Note. Means in the same column that do not share subscripts differ at $p < .05$ in the Tukey honestly significantly difference comparison. Means without a subscript are not significantly different from any other mean in the same column.

Primary Analyses

The first hypothesis, that metamotivational state interacts with arousal on hedonic tone, was confirmed. The hypothesis was tested by means of a standard multiple regression analysis using hedonic tone as the criterion variable. Predictor variables included metamotivational state, self-reported arousal, and the interaction of the two variables. The interaction term was generated by centering⁴ both variables and then multiplying the two variables together (Keppel & Zedeck, 1989). The third measurement of metamotivational state (T/PSI3) was used since it occurred closest in time to the measurement of the other two variables in this analysis, hedonic tone and self-reported arousal.

Bivariate correlations between hedonic tone and all other variables were conducted for the purpose of identifying any suitable covariates. Accounting for other sources of variance by means of including suitable covariates increases the internal validity of the analysis by eliminating other potential explanations for the variance of the criterion variable (hedonic tone). This is important since the predictor variables (arousal and metamotivational state) used in this analysis were not experimenter manipulated, but were individual-variables. Hence the internal validity of this analysis without the inclusion of covariates would be low. The correlation between hedonic tone and the level

⁴Centering is accomplished by subtracting the mean of a variable from each value. The result of this procedure is to create a new variable with the same range and scale but with a mean of zero. Achieving a mean of zero can also be accomplished by standardizing the variables, however, this affects the scale of the variables, and distorts the interpretation of the b-weights.

of performance was positive and significant, $r(113) = 0.36$, $p < .01$, indicating that a direct linear relationship existed between performance and hedonic tone. The significant correlation also indicated that performance should be included in the regression analysis as a covariate.

The multiple squared correlation for the entire model was 0.24, $F(4,108) = 8.44$, $p < .01$. Each predictor variable, including the interaction term, made a significant unique contribution to predicting hedonic tone, thus indicating that arousal and metamotivational state interact on hedonic tone. The b-weights and squared semi-partial correlations of the multiple regression are reported in Table 6. A more detailed review of this regression analysis is located in Appendix N.

Because the interaction was between two continuous variables, no cell means existed which could have been used to graph and easily interpret the nature of the interaction. In cases such as this, Darlington (1990) suggests interpreting the b-weight of the interaction term in the following manner. As one of the predictor variable increases by one unit, the slope of the relationship between the criterion variable and the remaining predictor variable changes by the amount of the b-weight of the interaction. The unstandardized b-weight for the interaction between arousal and metamotivational state was .09. Therefore, for each unit increase in a person's T/PSI score (i.e., going from telic to paratelic), the slope of the relation between hedonic tone and arousal increased by 0.09. This means that the slope of the relationship between hedonic tone and arousal was lower for people in a telic state than it was for people in a paratelic state. This interpretation is congruent with reversal theory since it predicts the correlation between hedonic tone and

Table 6

Standard Regression Analysis of Variables Predicting Hedonic Tone

Source of Variance	Regression Statistics			
	<i>b</i>	<i>sr</i> ²	<i>df</i>	<i>t</i>
Performance	0.29	0.14	(1,108)	4.46**
Metamotivational State	-0.28	0.05	(1,108)	-2.65**
Self-Reported Arousal	-2.96	0.05	(1,108)	-2.56*
State by Arousal Interaction	0.09	0.06	(1,109)	3.14**

* *p* < .05. ** *p* < .01.

arousal to be negative for people in a telic state, and positive for people in a paratelic state.

In order to create a visual representation of the interaction, it was necessary to divide the data into two groups by performing a median split using one of the predictor variables. The metamotivational state score (T/PSI3) was used for this purpose since it divided the sample into a telic and paratelic group. The median of the metamotivational state (T/PSI3) score was 42. Those participants with a score less than 42 ($N = 55$) represented individuals in a telic state, and those with a score equal to or greater than 42 ($N = 58$) represented individuals in a paratelic state.

A multiple regression, using all the same predictor and interaction terms as originally used for the entire sample, was repeated for both the telic and paratelic group. The intercepts and the unstandardized b-weights from the two regression analyses are reported in Table 7. Derived from these analyses were two regression equations describing the relation between hedonic tone and arousal: one regression equation for people in a telic state ($\text{hedonic tone} = 18.11 - 1.72 * \text{arousal}$), and another for people in a paratelic state ($\text{hedonic tone} = 9.68 + 1.49 * \text{arousal}$).

These regression lines, illustrated in Figure 4, demonstrate how the relation between arousal and hedonic tone changes as one goes from a telic to a paratelic state. As predicted by the first hypothesis, for individuals in the telic group, the relation between arousal and hedonic tone was negative, and for individuals in the paratelic group, the relation was positive.

To further aid in the interpretation of the significant interaction between

Table 7

Intercepts and b-weights Predicting Hedonic Tone From Arousal for Telic and Paratelic Groups

Regression Variable	State	
	Telic	Paratelic
Intercept	18.11	9.68
Arousal b-weight	-1.72	1.49

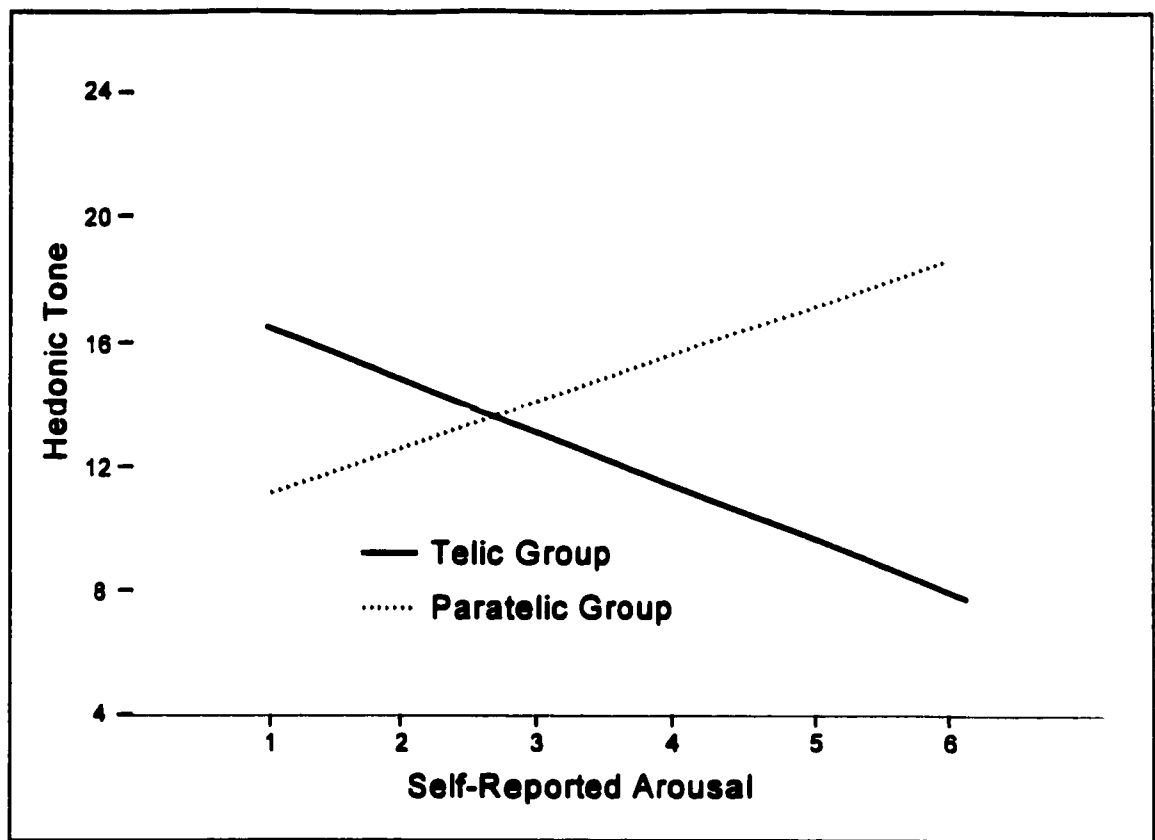


Figure 4. Interaction effect of metamotivational state and arousal on hedonic tone.

metamotivational state (T/PSI3) and arousal, three additional analyses were performed. The multiple regression was performed three more times with the following substitutions of predictor variables. First, T/PSI3 was replaced with T/PSI1, a measure of metamotivational state taken at the beginning of the procedure. Second, T/PSI3 was replaced with T/PSI2, a measure of metamotivational state taken just prior to completing the experimental trials, and third, T/PSI3 was replaced with the Paratelic Dominance Scale (PDS). In all three cases, the substitution of T/PSI3 was also done for the calculation of the interaction term. For all three analyses, the interaction terms were nonsignificant. As will be discussed later, these nonsignificant findings are in accordance with reversal theory.

The second hypothesis, that participants in conditions involving ambiguity will have significantly higher levels of arousal than participants in conditions with no ambiguity, was not confirmed. A one-way ANOVA using the four treatment conditions as the independent variable and self-reported arousal as the dependent variable disclosed significant differences between means, $F(3,109) = 5.08, p < .01$. Unfortunately, the results of the post hoc analyses (Table 5) were not as predicted by the second hypothesis. Contrary to expectations, participants with the highest level of arousal were in the ENA condition, the easiest condition of the four. The post hoc comparisons (Table 5) revealed that participants in the ENA and the IA conditions had significantly higher levels of arousal than participants in the DNA condition.

The failure to achieve the results predicted by hypothesis two has severe repercussions for the ability to properly test the third hypothesis, that is, the interaction

between metamotivational state and ambiguity. Testing of the third hypothesis was considered to be conditional on the predictions of both hypothesis one and two.

Hypothesis three, that metamotivational state and ambiguity would interact on hedonic tone, was not supported. Because ambiguity was represented by a categorical variable with four levels (i.e., ENA, DNA, IA, and CA) a General Linear Model (GLM) approach was necessary. A GLM approach is very similar to a multiple regression analysis, except that it allows for the inclusion of categorical variables as predictor variables. The GLM analysis conducted to test hypothesis three used hedonic tone as the criterion variable. Predictor variables included ambiguity, metamotivational state, and the interaction between ambiguity and state. Also included in the model was a covariate, performance. It was included because it was significantly correlated with the criterion variable, hedonic tone, $r(113) = 0.36, p < .01$.

The analysis was performed twice, once using T/PSI2, and again using T/PSI3 as the measure of metamotivational state. In the first analysis, using T/PSI2, the interaction between experimental condition and metamotivational state was nonsignificant. The only significant predictor of the model was the covariate, Performance, $F(1,104) = 4.16, p < .05$. The semi-partial correlation between performance and hedonic tone was 0.03. In the second analysis, using T/PSI3 as a predictor variable, the interaction was also nonsignificant, and the only significant predictor was the covariate, Performance, $F(1,104) = 4.64, p < .05$. The relation between performance and hedonic tone remained positive, and the squared semi-partial correlation was 0.04. For both analyses, this means that the degree to which participants enjoyed doing the experimental task (hedonic tone)

was directly related to how well they were doing.

An additional analysis was conducted substituting telic/paratelic dominance, as measured by the PDS, for the measure of metamotivational state. The interaction between experimental condition and PDS was nonsignificant. As with the two previous analyses, the only significant predictor was the covariate, Performance, $F(1,104) = 4.52$, $p < .05$. The relation was positive with a squared semi-partial correlation of 0.04. Due to the lack of any significant interactions between metamotivational state and ambiguity, the third hypothesis was not supported.

Secondary Analyses

Hypothesis four, that lability would be negatively correlated with extremity of dominance, was not supported. It was expected that the more extreme one's PDS score was, either in the telic or paratelic direction, the less likely they would be to experience reversals from one state to another.

Lability was operationally defined in two ways. The first was the number of reversals made during the study. Since metamotivational state was measured three times during the study, the number of reversals ranged from 0 to 2. The second way lability was operationally defined was based on the intra-individual variance of the three T/PSI scores. Larger intra-individual variance of T/PSI scores implied greater lability.

Extremity of dominance (Extremity) was defined as the absolute difference between one's PDS score and the median PDS score. Low scores indicate medium Telic/Paratelic Dominance, while high scores indicate either high Paratelic Dominance or high Telic Dominance.

Two analyses were performed to determine the relation between lability and Extremity. In the first analysis, an ANOVA was performed using Extremity as a dependent variable and number of reversals as an independent variable with three levels (0, 1, and 2 reversals). In the second analysis, a correlation was performed between Extremity and the intra-individual variance of T/PSI scores. The results from both analyses were nonsignificant, thus, the fourth hypothesis was not confirmed.

Hypothesis five predicted metamotivational state to be related to persistence. It was expected that while in a paratelic state, individuals would be more likely to perform the experimental trial an additional time. T-tests for independent samples was performed comparing the levels of metamotivational state between those participants who did perform the experimental trial again and those who did not. A t-test was performed for each of the three measures of metamotivational state (T/PSI1, T/PSI2, and T/PSI3). None of the analyses yielded significant results.

In an attempt to understand why some of the participants did repeat the experimental trial and others did not, a series of t-tests were performed using persistence as the grouping variable, and all major measured variables as the dependent variables. Measures included as dependent variables for these analyses included telic/paratelic dominance, performance, amount of time spent doing the experimental procedure (defined as the time elapsed from the beginning of the procedure to when participants were given the option of performing the experimental trial again), self-reported arousal, and hedonic tone. None of the analyses were significant.

As reported earlier, a Pearson's Chi Squared Test of Association was conducted

using persistence and the experimental conditions (ENA, DNA, IA, and CA) as dependent variables. This too was nonsignificant. It would appear, then, that none of the variables measured or manipulated during this study influenced participants' decisions to try the experimental task again.

Paratelic Dominance and Performance

The bivariate correlation between PDS and the number of correct responses made during the experimental trial (i.e., performance) was of borderline significance, $r(113) = -.18, p = .051$. Telic-dominant individuals had a tendency to have higher performance scores than paratelic-dominant individuals. A regression analysis was performed to determine if this result was either a spurious finding or if PDS score made a unique contribution to performance on the experimental trial.

Correlations between performance scores and other variables were conducted to discover suitable covariates. Three continuous variables were found to be significantly correlated to performance scores: number of training trials completed by the participant (Trials), $r(113) = -0.35, p < .01$, Minutes Per Block the participants needed during the blocks of training trials (MPB), $r(113) = .20, p < .05$, and the total amount of time spent doing training trials (Training Time), $r(113) = -0.29, p < .01$. Also included as a covariate was the categorical variable of experimental condition. As reported earlier, performance means of participants from different experimental conditions differed significantly, $F(3,109) = 62.62, p < .01$.

A standard multiple regression (Table 8) was performed using performance score as the criterion variable. Predictor variables included PDS and the interaction between

Table 8

General Linear Model Analysis of Variables Predicting Performance

Source of Variance	Regression Statistics		
	sr^2	df	F
PDS	.01	(1,102)	4.38*
Experimental Conditions	.08	(3,102)	8.63**
Number of Training Trials	.00	(1,102)	1.31
MPB	.00	(1,102)	0.35
Amount of Training Time	.00	(1,102)	0.08
Interaction of PDS and Experimental Condition	.01	(3,102)	0.95

Note. PDS = Paratelic Dominance Score. MPB = minutes per block.

* $p < .05$. ** $p < .01$.

PDS and the four experimental conditions. Covariates included Trials, MPB, Training Time, and the experimental conditions. The effect of the four experimental conditions was represented by three orthogonal comparisons (Keppel & Zedeck, 1989).

With the inclusion of all potential covariates from the study, the marginal relation between PDS and performance score became statistically significant. The multiple correlation for the entire model was 0.68, $F(10,102) = 21.68$, $p < .01$, and the semi-partial correlation of PDS with Score was -0.12, $t(102) = -2.09$, $p < .05$. This means that telic-dominant individuals performed better than paratelic-dominant individuals. Also, the interaction between PDS and experimental conditions was nonsignificant which indicates that the relation between PDS and performance was uniform across conditions.

Discussion

Hypothesis one was supported by the data. Not only was the interaction between arousal and metamotivational state significant, but the nature of the interaction was congruent with predictions made by reversal theory. From Figure 4, it is apparent that for people in a telic state, the relationship between hedonic tone and arousal was negative, and the relationship was positive for people in a paratelic state. Also, as predicted by reversal theory, the interaction assumes a 'cross' configuration. This indicates that high levels of arousal can be experienced as either positive or negative depending on one's metamotivational state. The same can be said of low levels of arousal.

It is important to note that the three variables used to demonstrate this interaction, metamotivational state (T/PSI3), arousal, and hedonic tone, were collected consecutively. This is an important fact since reversal theory asserts that it is the present metamotivational state that governs how arousal will be experienced. Additional analyses which substituted the measure of metamotivational state (T/PSI3) with measures of state taken earlier (T/PSI1 and T/PSI2) resulted in no significant interaction between metamotivational state and arousal. The same analysis was repeated using the PDS score instead of a state score, and the interaction between PDS and arousal was nonsignificant. These nonsignificant findings help to support reversal theory's contention that the best predictor of reactions to arousal is present metamotivational state, and not metamotivational state from the recent past or level of telic/paratelic dominance.

In addition to supporting reversal theory, these findings also have major implications for Hebb and Thompson's (1954) arousal theory. Hebb and Thompson (1954) assumed the

existence of a homeostatic system with one optimal level of arousal. According to arousal theory, the relationship between arousal and its subjective experience is described by an inverted-U. That is, neither very low levels nor very high levels of arousal result in pleasant experiences. If Hebb and Thompson (1954) are correct, only moderate levels of arousal are experienced as pleasant.

However, the results from hypothesis one suggest not a homeostatic system, but a bistable system with two levels of optimal arousal. Just as predicted by reversal theory, for participants in a telic state, a low level of arousal was most enjoyable; for those in a paratelic state, greatest enjoyment was associated with very high arousal.

Unfortunately, the remaining hypotheses were not supported. With reference to the second hypothesis, it was expected based on previous research (Gellatly & Meyer, 1992; Shackel, 1976), that ambiguity and arousal would have a positive linear relation. Therefore, it was expected that the arousal levels of participants in the experimental conditions involving ambiguity, due to either uncertainty or contradictory information, would be higher than those of participants in the nonambiguous conditions. However, this was not the case for the sample in this study. In fact, the condition that induced the highest level of arousal was the Easy Not Ambiguous (ENA) condition, the easiest condition with no ambiguity. It was this condition, in fact, that was expected to induce the lowest level of arousal.

One possible explanation for this result is that extraneous variables existed which had an impact on participants' levels of arousal. Not surprisingly, participants in the ENA condition, the easiest condition, had the highest level of performance. Participants in this condition scored an average of 16.96 correct diagnoses out of a possible total of 18. Much

research suggests that success or failure on particular tasks has a significant impact on an individual's mood (Cohn, 1991; Ebeling & Spear, 1980; Friedrich, 1996; Goldwater & Acker, 1975; Reeve, 1989; Theeboom, De-Knop, & Weiss, 1995). Despite not having any explicit feedback during the experimental trials, the presence of a positive significant correlation between performance and hedonic tone seems to indicate that the participants were able to gauge their performance. Participants who performed well enjoyed the task more. Therefore, it is possible that perceived performance acted as an extraneous variable that may have also accounted for the differences in arousal as well. The impact of this extraneous variable may have overshadowed any potential impact the ambiguity manipulation might have had on arousal.

An alternative explanation is that the ambiguity manipulation had no impact on arousal. Unfortunately, no measures were taken that assessed the participants' impressions of the amount of ambiguity inherent in the task. In retrospect, this would have been an ideal dependent variable to have included in the pilot study along with perceived difficulty.

Ambiguity proved to be a difficult variable to manipulate due to the potential for extraneous variables such as difficulty of the task and perceived performance. Also, ambiguity was difficult to manipulate because the concept is vague. While most people have an intuitive sense of what ambiguity is, operationally defining it was difficult. In this study, it was defined in terms of incomplete information and contradictory information. While it is safe to assume that ambiguous situations can involve one or both of these kinds of information, it is less certain that these types of information reliably induce a feeling of ambiguity. Hence, it is possible that the presence of incomplete information and

contradictory information in the context of the disease diagnosis task did not induce the desired feelings of ambiguity.

Prior to attempting to manipulate ambiguity again, more extensive pretesting would be recommended. Also advisable would be the inclusion of a comprehensive debriefing which asks participants to relate their experiences and impressions of various tasks. The most important aspect of the debriefing would be to ask participants to comment on both the presence and the intensity of any perceived ambiguity and how they reacted to it and how it made them feel.

When creating the research design of this study, several manipulations of ambiguity used by other authors were reviewed. However, all the manipulations of ambiguity reviewed involved performing some type of task. In retrospect, the use of a task may have been a mistake. By manipulating a task, it is impossible to avoid confounding variables such as the difficulty of the task and the impact of the participant's performance of the task. The alternative would be to expose participants to a situation involving ambiguous stimuli that does not involve performing any task. This would avoid the confounding effects of difficulty and performance.

In order to properly test the third hypothesis, it was necessary that the first two hypotheses be supported. The third hypothesis predicted that metamotivational state would interact with the presence of ambiguity, in much the same way that metamotivational state interacts with arousal (first hypothesis). This is because it was assumed that arousal would have a positive linear correlation with amount of ambiguity (i.e., the second hypothesis). However, this second assumption was not met. No interaction was found between

metamotivational state and ambiguity, and consequently, the failure to find support for the third hypothesis was not surprising.

As discussed previously, it is possible that the reasons for the lack of significant findings could be extraneous variables or poor manipulation of ambiguity. However, it is also possible that ambiguity was manipulated effectively, and that neither hypothesis two nor hypothesis three are true. If ambiguity does not interact with metamotivational state, it has implications for Apter's (1982) extensive treatment of humour and art. In general, humour and art are seen as being capable of inducing a pleasant hedonic tone because of the ambiguity inherent within them. "What reversal theory in fact suggests is that ambiguities, when consciously recognized, are disliked in the telic state of mind and enjoyed in the paratelic state" (Apter, 1982, p. 152). Unfortunately, Apter's speculation about ambiguity was not supported by the present study.

Data from this study did not support hypothesis four, that telic/paratelic dominance would be related to lability. As this was a secondary hypothesis, the method used did not offer a very powerful test of the relationship between telic/paratelic dominance and lability. In the present study, metamotivational state was measured three times over approximately 30 minutes. Past research (Walters et al., 1982) indicates that it is unlikely that many people will experience more than one reversal in such a short period of time. The data from this study demonstrated that the majority (74%) of the participants did not experience any reversals. As a result, the distribution of the lability variable (i.e., number of reversals) was both skewed and very small. In order to generate a more powerful test of the fourth hypothesis, future experimental designs should measure metamotivational state over a much

longer period of time, and take a higher number of measurements of state over that period of time.

No support was found for the fifth hypothesis which predicted that individuals would be more inclined to persist at a task while in a paratelic state. No difference in metamotivational state was found between those who did persist at the diagnosis task, and those who did not. However, given that this was also a secondary hypothesis, the method of the present study did not offer a powerful test of this hypothesis. Persistence was measured as a categorical variable: either the participant did or did not choose to try the experimental task a second time. It might be more advantageous to measure persistence as a continuous variable, measuring either number of attempts or the length of time one continues to persist at a task. This type of measure might provide more informative data than the one used in the present study.

A serendipitous finding was the negative correlation between Paratelic Dominance Scale (PDS) and one's performance on the experimental task. This means that telic-dominant individuals were more likely to perform well at this task than paratelic-dominant individuals. This is an unusual finding since reversal theory would not ordinarily predict that telic/paratelic dominance would have an influence over such a variable. Telic/paratelic dominance has been found to be a good predictor of some behaviours such as having a very structured daily routine (Svebak & Murgatroyd, 1985), or participating in very risky sporting activities (Kerr, 1987). However, in these cases, telic/paratelic dominance was used to predict activities that were indicative of one's general lifestyle.

Whenever trying to predict a person's behaviour or reaction to a situation at a specific

moment in time, it should be one's present metamotivational state that is the strongest predictor and not one's level of telic/paratelic dominance. For example, Rimehaug and Svebak (1987) discovered that physiological reactions (as measured by integrated electromyography) were better predicted by metamotivational state than by telic/paratelic dominance.

If being in either a telic or paratelic state did have an influence on participants' performances, then it should have been the metamotivational state measure that was correlated with performance, and not the telic/paratelic dominance score. This is because the state measure (T/PSI) indicates one's present state of mind, while the telic/paratelic dominance measure (PDS) only assesses the probability of being in either a telic or paratelic state.

If telic/paratelic dominance did influence one's performance, it was not by influencing the probability of being in a particular state at the time of performing the task. Instead, being in a telic state most of the time (being telic-dominant) might help prepare one for performing tasks such as the one used in this study. Hence, telic-dominant participants may have been better able to perform well at the task regardless of their metamotivational state at the time of doing the task.

It is possible that individuals who spend a majority of time in the telic state (i.e., those who are telic-dominant) develop specific skills to a greater extent than paratelic-dominant individuals that help them perform well in tasks such as the disease diagnosis task used in the present study. The diagnosis task requires concentration and memorization skills, skills which are also used in studying. Participants, all of whom were university students,

who are telic-dominant, probably spend more time studying and, therefore, may have been better prepared to perform well at the disease diagnosis task.

Conclusion

Unfortunately, only the first hypothesis was supported by this study. However, a likely reason for the lack of significant findings is the experimental design itself. First, the manipulation of ambiguity failed to produce the expected change in the level of arousal. As a result, hypotheses two and three were not supported. Also, when testing the relation between lability and extremity of dominance (i.e., hypothesis four), it would be better to measure metamotivational state over a longer period of time. Finally, when assessing the relation between metamotivational state and persistence in hypothesis five, persistence was measured as a categorical variable with two levels: either the participant did, or did not, persist. In the future, I believe it would be better to measure persistence as a continuous variable such as the number of attempts to perform an activity, or the length of time persisting at an activity. The use of this type of scale would probably yield more informative data than the dichotomous scale used in the present study.

The most important finding of this study was the significant interaction between arousal and metamotivational state on hedonic tone. The assumption that the telic/paratelic pair of metamotivational states moderates our reaction to arousal is integral to the argument that motivation to either seek or avoid arousal is governed not by a homeostatic system, but a bistable system. Reversal theory dismisses the idea that one optimal level of arousal exists. Instead, two metamotivational systems exist with respect to arousal (Apter, 1982), the telic and the paratelic. While in the telic state, we are arousal avoidant, and while in the paratelic

state, we are arousal seeking. Despite being a pivotal assumption of reversal theory, it is difficult to find any direct demonstrations of this interaction within the reversal theory literature. Hence, this study's demonstration of this interaction is highly relevant to the area of reversal theory research.

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Appendix A

Recruitment Speech

My name is Paul Pilon and I am here to ask you to participate in some research that I am doing in the Department of Psychology. The purpose of the research is to measure physiological reactions to different types of problem-solving tasks. All of the tasks are completed as a computer game. The computer is programmed to teach you how to do a simple problem-solving task and then it will test how well you have learned how to do that task. The physiological response that I want to measure is your heart rate. The type of heart rate monitor I am using is a type usually used to measure heart rate while exercising.

PRESENT HEART MONITOR STRAP

In order to be able to do this type of research I need to meet some specific conditions. These are:

- 1. I need to use a heart monitor that the participants can put on all by themselves, without removing any clothing. This strap can be easily put on while wearing a shirt or a sweater, however it does need to go on under the clothing. The heart monitor can be easily slipped on underneath a sweatshirt or sweater.**
- 2. For the duration of the experiment, participants will be alone in a private room. Any communication between the participant and the experimenters can be done through an intercom system.**
- 3. In the case of female participants, a female experimenter will be present to answer any questions about how to use the heart monitor.**

Some of the participants will not have to wear the heart monitor. These participants will simply be asked to pretest the problem-solving tasks. This means that the computer will ask you to do a variety of different tasks, and then you will be asked to rate how difficult they were. Testing the tasks in this way is necessary before going on to the actual experiment, where we measure heart rate.

In exchange for completing the research, you will receive one bonus point. The study should take less than an hour, but if it does take longer, you would receive an extra half bonus point for every half hour of participation.

If anyone has any questions about the research I would be happy to answer them at this point.

ANSWER QUESTIONS THE STUDENTS MAY HAVE ABOUT THE RESEARCH

I will circulate a schedule sheet for you to select the time and date you would like to reserve if you intend to participate. I would ask that you put down your name and phone number in the area corresponding to the date and time you wish to attend. The only reason why I am asking for your phone number is so that I might remind you of your appointment the night before. I would also like to hand out a map of how to get to the room where the study is being conducted. The building and room number are on the map. The study room is in 283-3 of Windsor Hall South, now called Chrysler Hall South. The map also has a place where you can mark down the date and time you have selected to attend.

Thank you for your time.

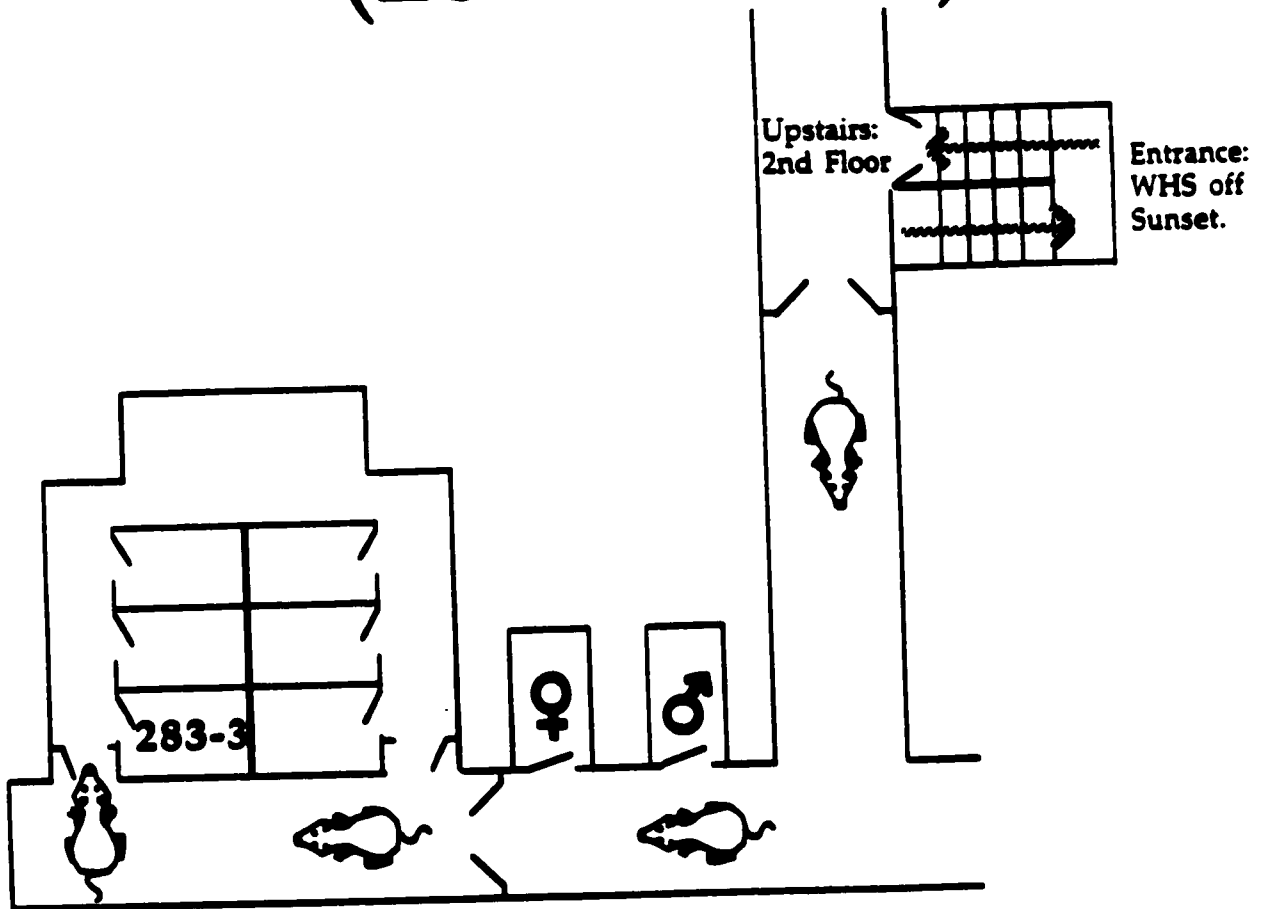
Appendix B
Sample Schedule Sheet

	Monday	Tuesday	Wednesday	Thursday	Friday	
	May 12	May 13	May 14	May 15	May 16	
	(Name/Phone#)	(Name/Phone#)	(Name/Phone#)	(Name/Phone#)	(Name/Phone#)	
9:00						
9:45						
10:30						
11:15						
12:00						
12:45						
1:30						
2:15						
3:00						
3:45						
4:30						
5:15						

Appendix C
Information Sheet

Map

Computer Task Study (283-3 WHS)



Date: _____

Time: _____

This time is reserved for you and no one else. If you cannot attend during your scheduled time period, then please notify us at least 24 hours in advance by leaving a message with the Department of Psychology secretaries (ext. 2217). Due to the brevity of the intercession, we will not reschedule another appointment for you if you fail to notify us that you cannot attend.

Appendix D

Pilot Study Briefing Script

Thank you for participating in this research. The purpose of this part of the research is to pretest some of the materials to be used in future studies. Pretesting simply refers to making sure that the materials used are having the desired or expected impact on participants. In this case, I am interested in how difficult people find different problem-solving tasks to be.

Unlike some of the research I will be doing later, this particular study will not involve wearing a heart monitor. In a few minutes I will be taking you into the next room where you will sit at a computer, and it will prompt you to complete a certain number of problem-solving tasks. The computer will guide you through two stages of the task. The first stage is a training or learning phase, and the second is a transfer phase.

In the training phase, the computer is going to help you learn how to do a specific problem-solving task. In this case, you are going to learn how to diagnose hypothetical diseases from a pair of symptoms. There are only six different diseases, and each one can be diagnosed using two symptoms. The computer will present you with two symptoms at a time, and it will be your job to select the correct disease that corresponds to those two symptoms.

SHOW PARTICIPANT PRINTED EXAMPLE OF TRIAL (See Figure 1).

At first, you won't know which disease causes which symptoms; however, as you make choices the computer will give you feedback about your responses. If you are correct, the computer will tell you so.

SHOW PARTICIPANT PRINTED EXAMPLE OF "CORRECT" FEEDBACK

(See Figure 2).

If you have not chosen the right disease, the computer will let you know which disease you should have chosen.

SHOW PARTICIPANT PRINTED EXAMPLE OF "INCORRECT" FEEDBACK

(See Figure 3).

Do you have any questions so far?

ANSWER ANY QUESTIONS PARTICIPANT MIGHT HAVE.

There are two important facts about the learning trials you should know before starting.

1. While some symptoms are unique to just one disease, some symptoms are shared by two different diseases.
2. Some diseases will occur more often than others during the learning trials.

The learning trials will be given in blocks of twelve. That is, one block of trials will consist of twelve separate diagnoses. The computer will give you a maximum of 16 blocks of learning trials. If you manage to get all 12 trials correct for two blocks in a row, then the training phase will be terminated and the computer will go on to the second phase of the program.

Do you have any questions so far?

ANSWER ANY QUESTIONS THE PARTICIPANT MIGHT HAVE.

Once you have gone through the training phase of the study, you will then go through the transfer phase. In the transfer phase, we will see how well the knowledge

you have learned is applied under different conditions. During the transfer phase, the number or the combination of symptoms used may change. It is your job to try and identify the correct disease despite these changes.

During the transfer phase, the symptoms will be manipulated in four different ways. These are called conditions. Under one condition, the symptoms will not be changed. They will appear exactly as they appeared during the training phase. Under the other three conditions, either the number or combinations of symptoms will be altered. During the transfer phase, you will not be getting any feedback about your responses. However, in between each condition, you will get two blocks of the training trials to refresh your memory before going on to the next condition of the transfer phase.

After you have completed each condition of the transfer phase, I will need you to rank how difficult each of the conditions was. So it is very important that while doing each of the conditions that you keep in mind which of the conditions was easier or harder than the others. At the end of each condition, the computer program will prompt you to rank those conditions you have already completed in terms of difficulty. That is, which was the least difficult, which was the next most difficult and so on.

Do you have any questions before beginning the study?

ANSWER ANY QUESTIONS PARTICIPANT MIGHT HAVE.

Before beginning the study, I am going to ask you to read and sign a consent form. Please keep a blank copy for yourself in order to have the names and phone numbers mentioned in the form.

ESCORT PARTICIPANT TO ADJACENT ROOM.

The computer program will start as soon as you press any key. Just follow the instructions that appear on the screen. If you have any questions during the study, please use the intercom system to talk to me. I will be in the next room while you are here.

Any last questions before I leave you?

Appendix E

Pilot Study Consent Form

The experimenter conducting this study is Paul Pilon, a graduate student in the Department of Psychology (253-4232, ext. 2217) at the University of Windsor, under the supervision of Dr. K. Lafreniere. The general purpose of this study is to create and test problem-solving tasks for use in future studies. You will be asked to complete a series of problem-solving tasks and rank them in terms of how difficult they were.

During the study, you will be asked to diagnose six different diseases based on two (2) symptoms. The disease names are hypothetical names and do not refer to actual real diseases. When you make a diagnosis, the computer will give you feedback as to whether or not you are correct. If you are not correct, the computer will inform you of the correct answer. Using this feedback, you will eventually learn how to correctly diagnose the diseases based on the symptoms given.

Once you have reached a certain level of expertise at this diagnosis task, you will begin a second phase of the study. The number and combinations of the symptoms will be varied in order to make the diagnosis task more difficult. By changing the number and combination of the symptoms, four different types of conditions will be created. After you have completed the conditions, the computer will prompt you to rank them in terms of difficulty.

The only people who will have access to the individual information gained from this study will be the experimenter, Paul Pilon, and his supervisor, Dr. K. Lafreniere. All of the information is kept completely confidential.

Remuneration for participating in this study is one half (1/2) a bonus point for every half hour of participation. A minimum of one (1) bonus point is given to all participants. The study should not take more than one hour of your time. At the end of the semester, the experimenter will contact your professor and inform him or her of how many experimental bonus points you have accumulated.

Participating in this phase of the study is completely voluntary and you have the right to refuse to participate without giving any explanation and without fear of any form of penalty whatsoever. You also have the right to stop participating at any time during the study without explanation or penalty.

If you have any questions, concerns or complaints regarding this study, you may direct them to the Committee Chair of the Department of Psychology Ethics Review Committee; Dr. S. Voelker (253-4232, ext. 2249). Questions and concerns about the study can also be directed to Paul Pilon (253-4232, ext. 2217) or Dr. Lafreniere (253-4232, ext. 2233).

I, _____,

(Name, please print)

have read and understand the information given within this consent form, and I voluntarily agree to participate in this study.

Signature: _____

Date: _____

Appendix F

Pilot Study Debriefing Script

Thank you very much for participating. Did you have any problems with the computer or any other difficulties you would like to point out to me?

Did you have any difficulty ranking the conditions?

Was it easy to remember which conditions were easy and which ones were hard while doing the study?

As I mentioned before, the reason for doing this pretest is to measure the varying levels of difficulty of the different tasks. Latter, this mock diagnosis task will be used to see how people react to ambiguity. I suspect that depending on what state an individual is in, he or she will react differently to ambiguity. If someone is in a playful state, then ambiguity might be pleasant, however, if someone is in a serious-minded state, then he or she will probably react negatively to the ambiguity.

Do you any questions about the study you would like to ask me?

IF THE PARTICIPANT HAS NO QUESTIONS, HE OR SHE IS EXCUSED.

Thank you again for participating and I will make certain that your professor receives notice at the end of the semester about the number of bonus points you have earned.

Appendix G

Paratelic Dominance Scale

Instructions and Items

Screen one: Instructions.

Thirty statements that describe different characteristics of people are going to be presented on the screen. Please read each statement carefully and decide whether the statement is TRUE or FALSE as it applies to you. Then indicate your decision by pressing either a T or F.

Screen two: Item one.

- __1. I think we should let the future look after itself.

Screen three: Item two.

- __2. I usually make decisions based on my long-term goals.

Screen four: Item three.

- __3. I have long-term life ambitions.

Screen five: Item four.

- __4. I regularly think of the future.

Screen six: Item five.

- __5. If I have extra time, I prefer to spend it accomplishing something important.

Screen seven: Item six.

- __6. I often take risks.

Screen eight: Item seven.

- __7. I usually make decisions based on the way I feel at the time.

Screen nine: Item eight.

- __8. I like being in unpredictable situations.

Screen ten: Item nine.

- __9. I usually do things just for fun.

Screen 11: Item ten.

- __10. I generally do not take anything too seriously

Screen 12: Item 11.

- __11. I am an adventurous sort of person.

Screen 13: Item 12.

- __12. I usually enjoy thinking about my long-term goals.

Screen 14: Item 13.

- __13. I almost never like to take chances.

Screen 15: Item 14.

- __14. I usually like to have peace and quiet.

Screen 16: Item 15.

- __15. I am a serious-minded person.

Screen 17: Item 16.

- __16. Usually, my leisure activities have no specific purpose.

Screen 18: Item 17.

- __17. I often do things just for fun.

Screen 19: Item 18.

- __18. I like to take each day as it comes.

Screen 20: Item 19.

- __19. I usually take life seriously.

Screen 21: Item 20.

- __20. I think it is important to plan for the future.

Screen 22: Item 21.

- __21. I prefer leisure activities that have a serious purpose.

Screen 23: Item 22.

- __22. I seldom make long-term plans.

Screen 24: Item 23.

- __23. I prefer my life to be predictable and orderly.

Screen 25: Item 24.

- __24. I prefer a peaceful, quiet environment.

Screen 26: Item 25.

- __25. I make decisions based on what I expect my future needs to be.

Screen 27: Item 26.

- __26. In my free time, I prefer activities with no serious purpose.

Screen 28: Item 27.

- __27. I would rather think about the present than the future.

Screen 29: Item 28.

- __28. I prefer to go through life safely.

Screen 30: Item 29.

- __29. I tend to be impulsive.

Screen 31: Item 30.

- __30. I prefer to think in the long term.

Scoring Instructions for the PDS

1. The following items comprise the Spontaneity subscale: 1, 2, 3, 4, 12, 20, 22, 25, 27, and 30.
2. The following items comprise the Playfulness subscale: 5, 7, 9, 10, 15, 16, 18, 19, 21, and 26.
3. The following items comprise the Arousal Seeking subscale: 6, 8, 11, 13, 14, 17, 23, 24, 28, and 29.
4. Recode items 2, 3, 4, 5, 12, 13, 14, 15, 19, 20, 21, 23, 24, 25, 28, and 30 so that a response of **T** is made **F**, and a response of **F** is made **T**.
5. For each subscale, sum the number of **T** (true) responses made. Each subscale has 10 items and therefore each can range from 0 to 10.
6. Sum the scores of the three subscale to get the total Paratelic Dominant Score. This score can range from 0 to 30.

Appendix H

Telic/Paratelic State Inventory

Instructions and Items

Screen one: Instructions.

Twelve pairs of phrases that represent opposites are going to be presented one at a time on the screen. Please select the number that is located BETWEEN each pair of words that best indicates how you were feeling in the LAST FEW MINUTES, just before this message appeared on the screen. For example, if the pair was

Feeling happy 1 2 3 4 5 6 Feeling sad

and you were definitely feeling happy, you would press the number "1." If you were definitely feeling sad, you would press the number "6." If you were feeling just a little bit sad, you would press the number "4."

Screen two: Item one.

Feeling playful 1 2 3 4 5 6 Feeling serious-minded

Screen three: Item two.

Wanting peace and quiet 1 2 3 4 5 6 Wanting adventure

Screen four: Item three.

Trying to accomplish something 1 2 3 4 5 6 Just having fun

Screen five: Item four.

Doing activity just for the fun of it 1 2 3 4 5 6 Doing activity because it may affect my future

Screen six: Item five.

Wanting to feel excitement 1 2 3 4 5 6 Wanting to feel calm

Screen seven: Item six.

Wanting to be
serious

1 2 3 4 5 6

Wanting to be playful

Screen eight: Item seven.

Concerned about the
future effects of my
current activity

1 2 3 4 5 6

Not concerned about the
future effects of my
activity

Screen nine: Item eight.

Wanting to just have
fun

1 2 3 4 5 6

Wanting to accomplish
something

Screen ten: Item nine.

Wanting to feel less
aroused

1 2 3 4 5 6

Wanting to feel more
aroused

Screen eleven: Item ten.

Living for the moment

1 2 3 4 5 6

Focusing on the future

Screen twelve: Item eleven.

Feeling serious

1 2 3 4 5 6

Feeling playful

Screen thirteen: Item twelve.

Feeling adventurous

1 2 3 4 5 6

Not feeling adventurous

Scoring Instructions for the T/PSI

1. The following items comprise the serious-minded/playful (SM/P) subscale:
1, 3, 4, 6, 8, 10, 11
2. The following items comprise the arousal-avoidant/arousal-seeking (AA/AS) subscale:
2, 5, 7, 9, 12
3. Recode items 1, 4, 5, 8, 10, and 12 so that a response of 1 equals a 6, a response of 2 equals a 5, a response of 3 equals a 4, a response of 4 equals a 3, a response of 5 equals a 2, and a response of 6 equals a 1.
4. Low values (1, 2, or 3) reflect the telic state. Higher values (4, 5, or 6) reflect the paratelic state.
5. Summed scores that are higher reflect the paratelic state; summed scores that are lower reflect a telic state. Sum over the items for each subscale:
SM/P: 1, 2, 4, 6, 8, 10, 11
AA/AS: 2, 5, 7, 9, 12
Sum over the two subscales to get a total T/PSI score.
6. Range of possible scores:
SM/P: 7-42
AA/AS: 5-30
T/PSI: 12-72
7. Suggested cut scores:
SM/P: telic < 23
AA/AS: telic < 18
T/PSI: telic < 41

Appendix I

Hedonic Tone Scale

Screen One: Instructions

Five pairs of phrases are going to be presented on the screen. Please select a number BETWEEN the pair of phrases that best indicates how you felt about doing the LAST SET OF DIAGNOSIS TASKS, the ones without any feedback.

Screen Two: Item One

I did not enjoy doing the task	1 2 3 4 5 6	I did enjoy doing the task
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Screen Three: Item Two

I felt bored while doing the task	1 2 3 4 5 6	I felt excited while doing the task
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Screen Four: Item Three

The task was pleasant to do	1 2 3 4 5 6	The task was not pleasant to do
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Screen Five: Item Four

I liked doing the task	1 2 3 4 5 6	I hated doing the task
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Screen Six: Item Five

I felt relaxed while doing the task	1 2 3 4 5 6	I felt anxious while doing the task
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Hedonic Tone: Scoring Instructions

1. Reverse code items 3, 4, and 5.
2. The sum of the item responses represents the participant's hedonic tone. The score of the hedonic tone measure ranges from 5 to 30. A low score represents a negative hedonic tone and a high score represents a positive hedonic tone.

Appendix J

Measurement of Psychological Arousal

Choose a number from 1 to 6 that best describes your present level of felt psychological arousal.

High felt psychological arousal implies that you feel worked up, anxious or excited. Low felt psychological arousal implies that you feel calm, relaxed or bored.

Which number best represents your present level of felt psychological arousal?

Low felt arousal 1 2 3 4 5 6 High felt arousal

Appendix K

Experiment Briefing Script

Thank you very much for being part of the research. The purpose of this study is to assess physiological reactions to various problem-solving tasks.

In a few minutes I will be asking you to go into the next room where you will sit at a computer and it will prompt you to complete a certain number of problem-solving tasks. The computer will guide you through two stages of these tasks. The first stage is a training or learning phase, and the second is a transfer phase. Throughout the study I will need you to wear a heart monitor. (NAME OF FEMALE RESEARCHER) is here to help you understand how to use the heart monitor when it is time to go to the next room. But first, I would like to make sure that you understand the problem-solving task that the computer is going to ask you to do.

In the training phase, the computer is going to help you learn how to do a specific task. In this case, you are going to learn how to diagnose hypothetical diseases from a pair of symptoms. There are only six different diseases and each one can be diagnosed using two symptoms. The computer will present you with two symptoms at a time, and it will be your job to select the correct disease that corresponds to those two symptoms.

SHOW PARTICIPANT PRINTED EXAMPLE OF TRIAL (see Figure 1).

At first, you won't know which disease causes which symptoms; however, as you make choices the computer will give you feedback about your responses which will help you make your next response. If you are correct, the computer will tell you so.

SHOW PARTICIPANT PRINTED EXAMPLE OF "CORRECT" FEEDBACK (see

Figure 2).

If you have not chosen the right disease, the computer will let you know which disease you should have chosen.

SHOW PARTICIPANT PRINTED EXAMPLE OF "INCORRECT" FEEDBACK

(see Figure 3).

Do you have any questions so far?

ANSWER ANY QUESTIONS PARTICIPANT MIGHT HAVE.

There are two important facts about the learning trials you should know before starting.

1. While some symptoms are unique to just one disease, some symptoms are shared by two different diseases.
2. Some diseases will occur more often than others during the learning trials.

The learning trials will be given in blocks of twelve. That is, one block of trials will consist of twelve separate diagnoses. The computer will give you a maximum of 16 blocks of learning trials. If you manage to get all 12 trials correct for two blocks in a row, then the training phase will be terminated and the program will go on to the second phase of the program.

Do you understand the procedure so far?

ANSWER ANY QUESTIONS THE PARTICIPANT MIGHT HAVE.

Once you have gone through the training phase of the study, you will then go through the transfer phase. In the transfer phase, we will see how well the knowledge you have learned is applied under different conditions. During the transfer phase, the number or the combination of symptoms used might or might not be changed. It is your

job to try to identify the correct disease despite these changes. Unlike the training phase, you will not receive any feedback about your performance.

At the end of the transfer phase, the computer will tell you what percentage of diagnoses you did get correct, and then it will offer you the opportunity to do the transfer task one more time if you so desire. However, only the data collected from the first attempt of the transfer phase will be used in data analysis.

At three times during the study, before the training phase, between the training and transfer phases and after the transfer phase, the computer will prompt you to answer a set of questions. All of the questions asked can be answered using a 6-point scale. All you need to do is follow the instructions and type in the number that corresponds to your answer.

Do you have any questions before beginning the study?

ANSWER ANY QUESTIONS PARTICIPANT MIGHT HAVE.

Before beginning the study, I would like you to read and sign a consent form. Please keep a blank copy of the consent form in order to have a copy of the names and phone numbers mentioned in the form.

ESCORT PARTICIPANT TO ADJACENT ROOM (IN THE CASE OF A FEMALE PARTICIPANT, THE FEMALE RESEARCHER TAKES OVER FROM THIS POINT ON).

In order to record your heart rate during the experiment, I need you to wear this heart monitor while participating in the experiment.

DEMONSTRATE USE OF HEART MONITOR.

I will be in the next room while you put it on. First put on the heart monitor and

then call me using the intercom system and I will check to see if the monitor is working properly.

Any last questions before I leave you?

ANSWER ANY REMAINING QUESTIONS AND THEN LEAVE THE ROOM.

Appendix L

Experiment Consent Form

The experimenter conducting this study is Paul Pilon, a graduate student in the Department of Psychology (253-4232, ext. 2217) at the University of Windsor, under the supervision of Dr. K. Lafreniere. During the study, you will be asked to diagnose six different diseases based on two (2) symptoms. The disease names are hypothetical names and do not refer to real diseases. When you make a diagnosis, the computer will give you feedback as to whether or not you are correct. If you are not correct, the computer will inform you of the correct answer. Using this feedback, you will eventually learn how to correctly diagnose the diseases based on the symptoms given.

Once you have reached a certain level of expertise at this diagnosis task, you will begin a second phase of the study. The number and combinations of the symptoms may remain the same or they may be changed somewhat. During this phase of the experiment you will attempt to make diagnoses using this new set of symptoms. The computer will not offer any feedback as to your performance. However, at the end of the diagnosis task, you will be informed as to what percentage of diagnoses you did get correct. At that time the computer will offer you another opportunity to do the task one more time if you so desire. However, only the data from the first attempt will be used in data analysis.

The purpose of this study is to measure people's reactions, including heart rate, to various problem-solving tasks including the one just described. In order to measure heart rate, it is necessary for you to wear a heart monitor during the experiment.

The only people who will have access to the individual information gained from

this study will be the experimenter, Paul Pilon, and his supervisor, Dr. K. Lafreniere. All of the information is kept completely confidential.

Remuneration for participating in this study is a half (1/2) bonus point for every half hour of participation. A minimum of one (1) bonus point is given to all participants. The study should not take more than one hour of your time. At the end of the semester, the experimenter will contact your professor and inform him or her of how many experimental bonus points you have accumulated.

Participating in this study is completely voluntary and you have the right to refuse to participate without giving any explanation and without fear of any form of penalty. You also have the right to stop participating at any time during the study without explanation or penalty.

If you have any questions, concerns or complaints regarding this study, you may direct them to the Committee Chair of the Department of Psychology Ethics Review Committee; Dr. S. Voelker (253-4232, ext. 2249). Questions and concerns about the study can also be directed to Paul Pilon (253-4232, ext. 2217) or Dr. Lafreniere (253-4232, ext. 2233).

I, _____,
(Name, please print)

have read and understand the information given within this consent form, and I voluntarily agree to participate in this study.

Signature: _____

Date: _____

Appendix M

Experiment Debriefing

Thank you very much for participating. Did you have any problems with the computer or any other difficulties you would like to point out to me?

The general purpose of the study is to see how people react to ambiguity. There are four different variations of the transfer phase of the study and each variation introduces different types and amounts of ambiguity. Also, before, during and after the experiment, the computer prompted you to answer several questions. These questions are designed to determine what state of mind you were in while doing the diagnosis task. We suspect that while in a playful state, people will react positively to the ambiguity, and while in a serious-minded state, people will react negatively to the ambiguity. We also suspect that increased ambiguity will also result in an elevated heart rate.

Do you have any questions you would like to ask me about the study?

IF THE PARTICIPANT HAS NO FURTHER QUESTIONS, HE OR SHE IS EXCUSE.

Thank you again for participating and I will make certain that your professor receives notice at the end of the semester about the number of bonus points you have earned.

Appendix N

Detailed Results of Regression Analyses

Summary of Standard Regression Analysis of Variables Predicting Hedonic Tone

Variable	B	SE B	sr ²	df	t
Step 1					
Constant	11.97	0.89			
Performance	0.28	0.07	0.13	1	4.12**
Step 2					
Constant	10.62	1.80			
Performance	0.28	0.70	0.13	1	4.15**
State	0.03	0.04	0.01	1	0.86
Step 3					
Constant	8.66	2.04			
Performance	0.27	0.07	0.12	1	4.05**
State	0.03	0.04	0.00	1	0.92
Arousal	0.57	0.28	0.03	1	1.99*
Step 4					
Constant	21.27	4.46			
Performance	0.29	0.06	0.14	1	4.46**
State	-0.28	0.11	0.05	1	-2.65**
Arousal	-2.96	1.15	0.05	1	-2.56*
State by Arousal	0.09	0.03	0.06	1	3.14**

Note. B=Unstandardized b-weight. SEB=Standard Error of the Estimate.

sr²=Semi-Partial Correlation. df=Degrees of Freedom. State = Metamotivational State as measured by the T/PSI. Arousal = Self-Reported Arousal

*p < .05. **p < .01.

Summary of General Linear Model Analysis of Variables Predicting Performance

Variable	SS	sr ²	df	F
Step 1				
PDS	129.11	.03	1	3.90
Error	3672.25		111	
Step 2				
PDS	78.82	.02	1	6.46*
Condition	2355.26	.62	3	64.38**
Error	1316.99		108	
Step 3				
PDS	58.63	0.02	1	4.92*
Condition	2001.53	0.53	3	55.93**
Trials	40.66	0.01	1	3.41
Error	1276.34		107	
Step 4				
PDS	54.13	0.01	1	4.52*
Condition	1982.41	0.52	3	55.20**
Trials	39.28	0.01	1	3.28
MPB	7.38	0.00	1	0.62
Error	1268.95		106	
Step 5				
PDS	53.57	0.01	1	4.43*
Condition	1982.40	0.52	3	54.68**
Trials	12.14	0.00	1	1.00
MPB	3.92	0.00	1	0.32
Time	0.00	0.00	1	0.00
Error	1268.95		105	
Step 6				
PDS	53.02	0.01	1	4.38*
Condition	313.31	0.08	3	8.63**
Trials	15.91	0.00	1	1.31
MPB	4.27	0.00	1	0.35
Time	1.02	0.00	1	0.08
Condition by				
PDS	34.62	0.01	3	0.95
Error	1234.33		102	

Note. PDS = Paratelic Dominance Scale. Condition = Experimental conditions manipulating ambiguity and difficulty. Trials = Number of trianing trials required by participant. MPB = Average minutes per block participant needed. Condition by PDS = Interaction between experimental conditions and PDS.
 * $p < .05$. ** $p < .01$.

VITA AUCTORIS

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